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PHISHING WEBSITES DETECTION BASED ON WEB SOURCE CODE AND URL IN THE WEBPAGE

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***Abstract*—** Major security issues for banking and financial institutions are Phishing. Phishing is a webpage attack, it pretends a customer web services using tactics and mimics from unauthorized persons or organization. It is an illegitimate act to steals user personal information such as bank details, social security numbers and credit card details, by showcasing itself as a truthful object, in the public network. When users provide confidential information, they are not aware of the fact that the websites they are using are phishing websites. This paper presents a technique for detecting phishing website attacks and also spotting phishing websites by combines source code and URL in the webpage.

Keywords*—*Phishing, Website attacks, Source Code, URL.

I.INTRODUCTION

Phishing is a type of practice done on the Internet where personal details are obtained by unlawful methods. It is an online kind of pretexting (rewriting or changing the original information) where fraud can take place by an attacker who appears to be someone else to get the most sensitive details from users [1]. Fraudsters looking to gather financial information have developed a new way to lure unsuspecting victims: they go phishing. In the first half of 2012, the RSA Anti-Fraud Command Center identified 195,487 unique phishing attacks – an increase of 19% as compared to the second half of 2011[3]. The word "phishing" originally comes from the analogy that early Internet criminals used e-mail lures to "phish" for passwords and financial data from a sea of Internet users. The use of "ph" in the terminology is partly lost in the annals of time, but most likely linked to popular hacker naming conventions such as "phreaks" which traces back to early hackers who were involved in "phreaking" – the hacking of telephone systems. The term was coined in the 1996 timeframe by hackers who were stealing America Online (AOL) accounts by scamming passwords from unsuspecting AOL users[2]. The most common purpose of phishing scams include:

• **Theft of login credentials** – typically credentials for accessing online services such as eBay, Hotmail, etc. More recently, the increase in online share trading services has meant that a customer's trading credentials provide an easy route for international money transfers.

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- **Theft of banking credentials** – typically the online login credentials of popular high-street banking organizations and subsequent access to funds ready for transfer.

- **Observation of Credit Card details** – access to a steady stream of credit card details (i.e. card number, expiry and issue dates, cardholder's name and credit card validation (CCV) number) has immediate value to most criminals.
- **Capture of address and other personal information** – any personal information, particularly address information, is a highly saleable and in constant demand by direct marketing companies.
- **Distribution of botnet and DDoS agents** – criminals use phishing scams to install special bot and DDoS agents on unsuspecting computers and add them to their distributed networks. These agents can be rented to other criminals.

Attack Propagation – Through a mixture of spear phishing and bot agent installations, phishers can use a single compromised host as an internal "jump point" within the organization for future attack. The proposed phishing website detection system will detect threats and indicate that e-mails, websites or the URL's are not secured and help the user avoid the hacker's trap. Such a type of detection builds confidence in both the users and the Internet community. The phishing website detection system will guide users by providing knowledge of Internet threats. In phishing detection, there are two types of techniques: the white list technique and the heuristic based mechanism. These two techniques act as filters in detecting phishing websites. In white list technique, a few anti-phishing websites are listed. If the user accessed websites are not in the white list, then these will be concluded as phishing websites. The heuristic based mechanism works with various aspects like keywords and domain name to decide whether the website is a phishing website or not [1].The rest of the paper is as follows: Section II discusses about the background, section III presents the design and implementation of the system, section IV describes the evaluation procedure and results and final conclusions are made in section V.

II. BACKGROUND AND RELATED WORK

A. Classification of Anti-Phishing Solutions

Phishing solutions can be broadly classified into five categories [11]. They are:

CANTINA:

A novel content-based approach for detecting phishing web sites. CANTINA takes Robust Hyperlinks, an idea for overcoming page not found problems using the well-known Term Frequency / Inverse Document Frequency (TF-IDF) algorithm, and applies it to anti-phishing. We described our implementation of CANTINA, and discussed some simple heuristics that can be applied to reduce false positives. We also presented an evaluation of CANTINA, showing that the pure TF-IDF approach can catch about 97% phishing sites with about 6% false positives, and after combining some simple heuristics we are able to catch about 90% of phishing sites with only 1% false positives [3].

PILFER:

We propose a new method for detecting these malicious emails called PILFER. By incorporating features specifically designed to highlight the deceptive methods used to fool users, we are able to accurately classify over 92% of phishing emails, while maintaining a false positive rate on the order of 0.1%. These results are obtained on a dataset of approximately 860 phishing emails and 6950 non-phishing emails. The accuracy of PILFER on this dataset is significantly better than that of Spam Assassin, a widely-used spam filter.[4].

Malicious Web site URLs:

An approach to this problem based on automated URL classification, using statistical methods to discover the tell-tale lexical and host-based properties of malicious Web site URLs. These methods are able to learn highly predictive models by extracting and automatically analyzing tens of thousands of features potentially indicative of suspicious URLs. The resulting classifiers obtain 95–99% accuracy, detecting large numbers of malicious Web sites from their URLs, with only modest false positives [5].

Page Rank:

This work uses the PageRank value and other features to classify phishing sites from normal sites. We have collected a dataset of 100 phishing sites and 100 legitimate sites for our use. By using this Google PageRank technique 98% of the sites are correctly classified, showing only 0.02 false positive rate and 0.02 false negative rate. [6].

Lexical Analysis

This paper presents a lexical URL analysis (LUA) technique to enhance the classification accuracy of anti-phishing email filters. Although the LUA feature is primarily focused to classify phishing websites, it proved to be effective to classify email messages due to the fact that most phishing email messages contain URLs. According to the performance evaluation, the LUA feature proved to be effective in enhancing the classifier's accuracy in all features subsets [7].

Detecting Webpage Source Code

We propose a phishing detection approach based on checking the webpage source code, we extract some phishing characteristics out of the W3C standards to evaluate the security of the websites, and check each character in the webpage source code, if we find a phishing character, and we will decrease from the initial secure weight. Finally we calculate the security percentage based on the final weight, the high percentage indicates secure website and others indicates the website is most likely to be a phishing website. We check two webpage source codes for legitimate and phishing websites and compare the security percentages between them, we find the phishing website is less security percentage than the legitimate website; our approach can detect the phishing website based on checking phishing characteristics in the webpage source code.[8]

Behavior based Detection:

A novel approach to detect phishing websites based on analysis of users' online behaviors – i.e., the websites users have visited, and the data users have submitted to those websites. Such user behaviors cannot be manipulated freely by attackers; detection based on those data can not only achieve high accuracy, but also is fundamentally resilient against changing deception methods [9].

III. Evaluation Procedure and Algorithm

Phase I: ***Blacklist:***

When user enters into the web browser and type a URL in web page. Check whether the site is pishing or not in the black listing. It is holding a phishing urls in the list .If any illegitimate site will appears, it will alert user web browser. Otherwise it goes to web parsing and heuristics terms.

Phase II: ***Scripting in the source code:***

A normal web user does not have knowledge whether a website is a malware. In the following steps are;

a) Web parsing:

Web parsing is a process in which every HTML code from the source of the web page is parsed. Tags such as <>, html, br, textbox, regular expressions, etc., will be eliminated in this method each and every HTML tag in the source of the webpage are parsed.

b) Separating the Required Tokens:

After parsing is done on the source of the webpage only the data and information other than the unwanted links and tags will be displayed. After parsing the web page, the required tokens are separated. A token could be a keyword, an operator, or a punctuation mark.

c) Classification of Scripting Tokens

If any external tokens are found while parsing, must be classified.These external tokens are created by hackers generally known as man-in-the-middle. Finally we text identification from the scripting and weight based find out phish site or legitimate site.

Phase III: ***Classification of Heuristics:*** In this phase classification a url by using heuristics based. We refer before, finally obtain a phishing or legitimate site. The contributions of this paper are: 1) to show how PageRank value can be useful to detect phishing. 2) An implementation to show high accuracy of classification of phished web sites. 3) Considering other features like age of the domain, suspicious URL, whether the domain contains IP address or not, number of dots and whether it is taking user personal information as input or not.

CONCLUSION

Thus, Phishing has become a major threat to information security and personal privacy. This paper represents new anti-phishing technique based on URL domain identity and scripting mechanism. It first identifies the related authorized URL. We used approximate classification algorithm. Two techniques i.e. URL domain identity and scripting are combined, so this proposed work performs better than other existing tools. This will reduce latency period of detection of phishing URLs.

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Analysis of Route Discovery in Mobile ad-hoc Network Routing using Information Systems

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Abstract: Mobile Ad hoc NET works (MANETs) are group of wireless mobile nodes that can dynamically form a network without any infrastructures wherein mobile nodes are highly co-operative. In MANETs, the movement of nodes is uncertain may cause links to break and low battery life of mobile nodes may cause nodes to fail. The connectivity of the entire network is uncertain and may not be known to any particular node. The work presented in this studies routing in cache-based ad hoc routing protocols, based on the Information Systems of Rough Set Theory (RST). The Rough Set Theory is a new mathematical tool to deals with vagueness and uncertainty and applied for cache based routing protocols in MANETs. The cache in mobile nodes looks similar to the information system of Rough Set Theory. The direct use of information systems in mobile nodes are used to assist routing of data packets and the decision systems are used to predict the next hop for a destination in MANETs.

Keywords— *MANETs; Dynamic Source Routing (DSR); Rough Set Theory (RST);*

I INTRODUCTION

In the recent years Mobile Ad- hoc network (MANET) [4] has found applications especially to overcome the limitation of Bandwidth in wireless network. Wireless networks play an important role in both military and civilian systems. An ad hoc network is a collection of wireless mobile nodes forming a temporary network with no centralized entity and without aid of any established infrastructure. Messages are exchanged and relayed between mobile nodes. In fact, an ad hoc network has the capability of making communications possible even between two mobile nodes that are not in direct range with each other: packets to be exchanged between these two nodes are forwarded by intermediate nodes, using routing protocols.

A number of routing protocols [1] and [2] has been proposed for MANETs. Most of the routing protocols in MANETs are either proactive, reactive or hybrid. Proactive protocols are table driven. In **Proactive** routing protocols, the mobile nodes are maintaining a table of routes to every destination for this reason they periodically exchange the control messages and hence there is no latency in discovering routes. In **Reactive** routing protocols routing information is acquired only when there is need for it. Each mobile node maintains a route cache of known routes. The needed routes are calculated on demand. Routes are discovered by some global search and hence there is latency in route discovery.

1.1. DYNAMIC SOURCE ROUTING PROTOCOL (DSR)

DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do stated in [3]. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration. For restricting the bandwidth, the process to find a path is only executed when a path is required by a node (On-Demand-Routing). In DSR the sender (source, initiator) determines the whole path from the source to the destination node (Source-Routing) and deposits the addresses of the intermediate nodes of the route in the packets. DSR is beacon-less which means that there are no hello-messages used between the nodes to notify their neighbours about their presence.

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DSR contains 3 phases

- Route Discovery (find a path)
- Route Maintenance (maintain a path)
- Route Failure Handling(If the link fails)

1.2. ROUGH SET THEORY

Rough set theory was proposed by Pawlak [5]. It is based on the rules of data mining and artificial intelligent algorithms. It is suitable to discover uncertain and incomplete implied knowledge. A data set is represented as a table, where each row represents an event or an object or an example or an entity or an element. Each column represents an attribute that can be measured for an element. This table is called an information system. The set of all elements is known as the universe.

For example, if the information system describes a hospital, the elements may be patients; the attributes (condition attributes) may be Symptoms and tests; and the decisions (or decision attribute) may be diseases.

In an information system, elements that have the same value for each attribute are indiscernible and are called elementary sets. Subsets of the universe with the same value of the decision attribute are called concepts. A positive element is an element of the universe that belongs to the concept. For each concept, the greatest union of elementary sets contained in the concept is called the lower approximation of the concept and the least union of elementary sets containing the concept is called the upper approximation of the concept. The set containing the elements from the upper approximation of the concept that are not members of the lower approximation is called the boundary region. The lower approximation of the concept is also known as the positive region. A set is said to be rough if the boundary region is non-empty. A set is said to be crisp if the boundary region is empty.

Variable Precision Rough Sets (VPRS) [9], proposed by Ziarko, is a generalization of the rough set model, aimed at modeling classification problems involving uncertain or imprecise information. Using VPRS model, the lower and upper approximations are deduced in probabilistic terms, leading to generalized concepts of rough set approximations.

In RST, the lower approximation of a concept is defined using an inclusion relation. Here in VPRS, the lower approximation is defined using a majority inclusion relation. The β-positive region is the union of elementary sets which are either completely contained in the concept or are almost contained in the concept, with a maximum error of $1 - \beta$. The conditional probability of an element being positive in an elementary set is the probability that the element is positive, given that the element belongs to that elementary set. It is the ratio of the number of positive elements in that elementary set to the number of elements in that elementary set. When this conditional probability is greater than the threshold value β ($0.5 < \beta \leq 1$) the elementary set is said to fall in the β-positive region.

1.3. INFORMATION SYSTEMS AND DECISION SYSTEMS

In Rough Set Theory, [6] a data set is represented as a table, where each row represents an *element*. Each column represents an *attribute* that can be measured for an element. This table is called an *information system*. The set of all elements is known as the *universe***.**

Consider a universe U of element. Formally, an information system I is a quadruple I= (U,A,V,ρ), where A is the non-empty, finite set of attribute;

$V=U_{a\in A}V_a$is the set of attributes, Where V_a is the set of possible values of attribute *a;*

ρ: U*A→V is an information function, Such that for every element x Є U, ρ $(x,a) \in V_a$ is the value of attribute a *for element x.*

The information system can also be viewed as an *information table,* where each element $x \in U$ corresponds to a row, and each attribute $a \in$ A corresponds to a column.

I= (U, A U {d}, V, ρ), is known as a *decision system*, when an attribute *d* is specified as the decision attribute. A decision system is used for predicting the value of the decision attribute. A is the known as the set of *condition attribute.*

Regions of the Universe

In Rough Set Theory [7] and [10], An equivalence relation **R**, called *indiscernibility relation*, is defined on the universe **U** as

R={(x,y) $\in$U $\times$ U $\forall$ a $\in$ A, ρ(x,a)=ρ(y,a)}

In the information system **I**, the *elementary set* containing the element$x \in U$, with respect to the indiscernibility relation **R** is

$[x]_R$ **= {y$\in$U | yRx}**

The *lower approximation* of the concept $X \subseteq U$with respect to **U** and equivalence relation **R** on **U**, is the union of the elementary sets of **U** with respect to R that are contained in X, and is denoted as

$\boldsymbol{R_X}$= {x | $[x]_R \subseteq$ X}

The *upper approximation* of X is the union of the elementary sets of U with respect to **R** that have a non-zero intersection with **X** , and is denoted as

$\boldsymbol{R_X}$ ={x |$[x]_R \cap$ X$\neq \emptyset$}

The *lower approximation* of X is also known as the *Positive region* of X . The set $\boldsymbol{BN_R(X) = R_X - R_X}$ is called the *Boundary region* of X. The set **U**- $\boldsymbol{R_X}$ is called the *Negative region of* X.

The conditional probability that an element in an elementary set is positive is $\boldsymbol{P}(\_|[x]_R|) = \frac{|[x]_R \cap X|}{|[x]_R|}$.

The conditional probability that the element in the elementary set is negative is

$\mathbf{P}(\_|[x]_R|) = \mathbf{1} - \boldsymbol{P}(\_|[x]_R)$.

When the context is clear, the *conditional probability* of an elementary set is taken to be $\boldsymbol{P}(\_|[x]_R)$.The β_u-*positive region* is the union of the$\beta_u$elementary sets whose conditional probability $\beta_u$is greater than or equal toβ_u where β_u >0.5. The β_l-*negative region* is the union of the elementary sets whose conditional probability$\beta_l$is less than $\beta_l$where $\beta_l \leq$0.5. These are based on the definitions in [8]. When$\beta_u = 1 - \beta_l$, we denote it as β, and note that $\beta_l = 1 - \beta$.The range of is β(0.5,1] in the original VPRS definition. It appears that when the decision attribute is multi-valued with k as the number of possible values, the range of is β (1/k,1].

II. RESEARCH BACKGROUND

2.1. INFORMATION SYSTEM WITH LINKS

This section presents the use of thresholds in routing **[8].** The information system captures the links in the route rather than the presence of mobile nodes in the route. Let an information table I_m = (U_m,A_m,V_m,ρ_m) be associated with each mobile node m∈M. Here, Am represents the set of all possible links between the nodes. Each condition attribute aϵA_m in the attribute set corresponds to a particular link in the set of all possible links between the nodes. Each condition attribute is a Boolean attribute, with V_a ={0,1}, and is set to 1 or 0 depending on whether that link is present in the route associated with that element or not, S, V_m={0,1}. $A_m$is the same in all mobile nodes and hence is denoted as A. Similarly, $V_m$is denoted as V. $\rho_m$is the information function.

Consider an element xϵU_m corresponding to a route $m_1 m_2$...., m_k , $m_i \epsilon$M, i=1,2....k. When a row is added to the information table, the values of the condition attributes corresponding to the links $m_1 m_2$,$m_2 m_3$,.....$m_{k-1} m_k$ are set as 1.Consider a mobile node m that learns the routes are $mm_1 m_4 m_5$, $mm_1 m_5$, $mm_4 m_5$, $mm_5 m_1$, $mm_4 m_1$,$m_1 m_4$, $mm_1 m_4 m_5$, mm_1. Table 1 shows the route cache of mobile node m and Table2 shows the corresponding entries in the information table. In Table 2, the entries x_6,x_7,x_8 correspond to the routes $mm_1 m_4$,$mm_1 m_4 m_5$, mm_1 respectively. These routes or part of the route are already present in the route cache. So these routes are added only to the information table and not to the route cache.

$mm_1 m_4 m_5$
$mm_1 m_5$
$mm_4 m_5$
$mm_5 m_4$
$mm_4 m_1$

Table 1: Entries in route cache

2.2. DECISIONSYSTEM WITH LINKS

Let the decision system of a mobile node m be $\{U_m, A_m \cup \{d\}, V_m, \rho_m\}$, where d is the decision attribute. The decision attribute d is a Boolean attribute. Let B be a subset ofA_m, such that each element in B is a link that has all links to the next hop nodes from the current mobile node m. Let x_i and x_j be members ofU_m.

Table 2: Information table with links as attributes

	mm_1	mm_4	mm_5	m_1m_4	m_1m_5	m_1m	m_4m	m_4m_1	m_4m_5	m_5m	m_5m_1	m_5m_1
x_1	1	0	0	1	0	0	0	0	1	0	0	0
x_2	1	0	0	0	1	0	0	0	0	0	0	0
x_3	0	1	0	0	0	0	0	0	1	0	0	0
x_4	0	0	1	0	0	0	0	0	0	0	1	0
x_5	0	1	0	0	0	0	0	1	0	0	0	0
x_6	1	0	0	1	0	0	0	0	0	0	0	0
x_7	1	0	0	1	0	0	0	0	1	0	0	0
x_8	1	0	0	0	0	0	0	0	0	0	0	0

The indiscernibility relation is defined as

R={(x_i,x_j)$\in U_m \times U_m \forall$ **a** $\in$ **B,** ρ_m**(x_i,a)=**ρ_m**(x_j,a)}**

That is, among the routes considered by a mobile node m, those that have the same next hop are indiscernible and belongs to the same elementary set. Let X is a subset of U_m such that for each element in X, the Concept X has all routes that have the destination m_t in it. Consider an elementary set $[x_i]_R$ that have all routes considered by m which have the same next hop m_i .

Among these routes, some may have the destination m_t in it. Let the conditional probability P $(m_t|[x_i]_R)$ represent the ratio of the number of routes with m_t in $[x_i]_R$to the total number of routes in$[x_i]_R$.

That is, P $(m_t|[x_i]_R) = \frac{|[x_i]_R \cap m_t|}{|[x_i]_R|}$**.** The β −positive region consists of those elementary sets for which the value of $P(m_t|[x_i]_R)$ is greater thanβ.

III. RELATED WORKS

3.1. ROUTING USING THRESHOLDS IN A DECISION SYSTEM WITH LINKS.

3.1.1. Routing based on thresholds ($DSR_{\beta max}$)

Initially, the values of all condition attributes are set to 0. For each link in the route that is learnt or used, the values of the corresponding condition attributes in the information table are set to one. In the source node, a shortest route cache if available is placed as the source route in the data packet as in DSR and DSR+. If a route is not available in the route cache, a route discovery is done. The decision system is used to find the best next hop (Algorithm 1) in the source node and in any intermediate forwarding node.

When a next hop is to be found from the information system, all possible next hops are first considered. Here, an elementary set has all routes that have the same next hop. For a particular next hop, the ratio of the number of the number of routes that will lead to destination with this next hop to the total number of routes with this next hop (may are may not leads to the destination) is found. If the ratio is greater than a threshold β, then the elementary set falls in the β positive region. If the given destination is next hop, then that node itself is chosen as the next hop. Else, of all the next hops corresponding to the elementary sets in the β- positive region,

The node that will lead to the destination and that use the maximum number of times, for which the number of entries in the elementary set is not one, is chosen as the next hop. If the next hop that is found from the information system is different from the one in the source route that is already in the data packet, this new next hop is appended to the source route in the data packet set the current node and a flag is set in the data packet, to know that the source route taken from the source node has changed.

If a next hop cannot be determined from the information system, or if the next hop found from the in the information system results in a loop, then the data packet is forwarded according to the source route.

Algorithm 1: Finding a next hop in $DSR_{\beta max}$

```
findNextHopDSRbetamax()
{
foreach nexthop nh do
ratio[nh] = 0;
nexthopcount[nh]=0;
destnexthopcount[nh]=0;
    foreach row in the information system do
       if the route corresponding to this row has nh as the
next hop then
nexthopcount[nh] = nexthopcount[nh] + 1;
          if the route corresponding to this row will lead to
the destination then
destnexthopcount[nh] =destnexthopcount[nh] + 1;

           end
        end
     end
ratio[nh] =destnexthopcount[nh]/nexthopcount[nh];
 if ratio[nh]>β and  max(destnexthopcount[nh])  then
break;
 end
end
return this next hop nh;
```

3.2. PERFORMANCE EVALUATION

The network simulator ns2 [11] is used for the experiments. The following parameters are ones that have been often used in such studies. The random waypoint mobility model is used in a rectangular field. Constant bit rate traffic sources are used. A transmission range of 250 m is used. The link layer modelled is the Distributed Coordination Function (DCF) of the IEEE 802.11 wireless LAN standard. The source- destinations pairs (connections) are spread randomly over the network.Parameters which are used in simulation are shown in Table

Table 3.1. Simulation Parameters

Simulation Parameters	
Routing Protocol	DSR
Simulation Time	500 secs
Number of Nodes	20
Simulation Area	1500 × 1500
Speed	Min=2.0m/sec,Max=6.0m/sec
Packet Size	512 Bytes
Pause time	20 secs
Traffic Type	CBR
Initial Power	100
Queue Length	50

3.1. The performance of $DSR_{\beta max}$ is evaluated using the following metrics that are normally used in such studies:

(i) Packet delivery ratio: The ratio of the data packets delivered to the application layer of the destination to those sent by the application layer of the source node.

(ii) Average end-to-end delay: The average delay from when a packet is sent by the source node until it is received by the destination node.

A performance comparison of DSR_{β} and proposed $DSR_{\beta max}$ routing protocols for mobile ad hoc network is presented as a function of pause time. Performance of these routing protocols is evaluated with respect to End-to-End Delay and Packet Delivery Ratio**.**

Figure 1. shows the difference in the End-to-End delay of DSR_{β} and proposed $DSR_{\beta max}$ and Figure 2 shows the difference in the Packet Delivery Ratio of DSR and proposed

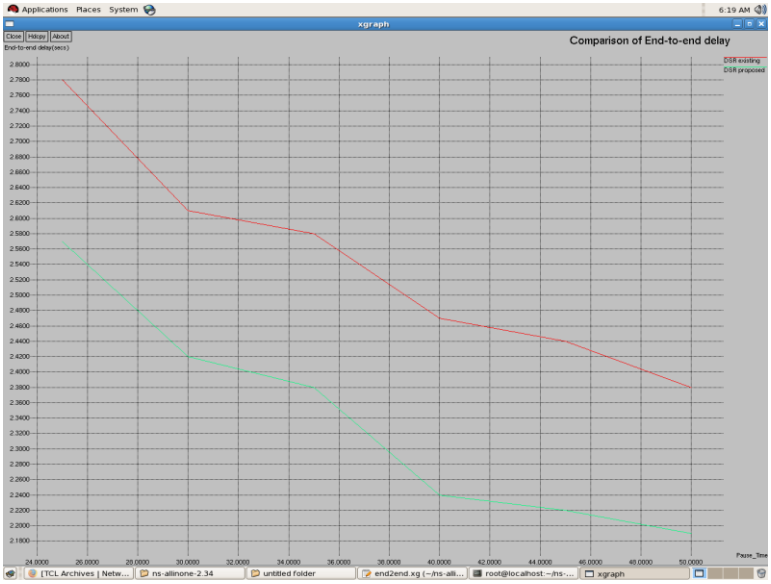

Figure 1: End-to-End Delay vs. Pause_Time

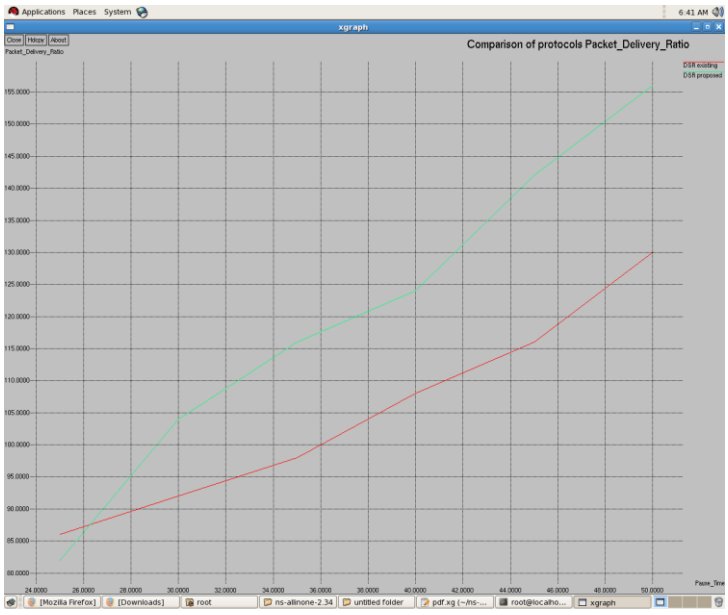

Figure 2: Packet_Delivery_Ratio vs. Pause_Time

IV. CONCLUSION

Thus the information system of RST was first implemented into mobile ad hoc networks and was used similar to a cache in a mobile node. In the routing protocol DSR the information system was incorporated into the mobile node. When choose a next hop DSR_{β}, the mobile node that will lead to the destination with the minimum number of entry in the cache is used as a criteria from the information system when the number of connection is less. In order to overcome the connection constraint the $DSR_{\beta max}$ is proposed. The performance of DSR and the the enhancement DSR_{β} was studied with the proposed work. It was seen that $DSR_{\beta max}$ performed better than DSR and DSR_{β} . The information system in the mobile node was adapted and the attributes of the information system were taken as the links from a route of mobile nodes. $DSR_{\beta max}$ used this information system to choose a better next hop while routing data .

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Partial Highest Possible Edge Analysis for Interactive Image Accessibility

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***Abstract*:** Relevance feedback is a technique that takes advantage of human-computer interaction to refine high level queries represented by low level features. Among RF schemes, the most popular technique is SVM based RF scheme. When SVM is used as a classifier in RF, there are two strategies. One strategy is to display the most positive images and use them as the training samples. The most-positive images are chosen as the ones farthest from the boundary on the positive side, plus those nearest from the boundary on the negative side if necessary. Another strategy is that most of SVM based RF scheme does not consider the unlabeled samples even though they are useful in constructing a good classifier. To overcome these drawbacks, in this paper we propose a biased maximum margin analysis (BMMA) and semi supervised BMMA (semiBMMA) for integrating the distinct properties of feedbacks and also to utilize the information of unlabeled samples. The BMMA differentiates positive from negative feedbacks, whereas semiBMMA takes into account the information of unlabeled samples by the introduction of Laplacian regularizer to BMMA. To validate the efficacy of the proposed approach, we test it on both synthesized data and real-world images. Promising results are achieved and this can significantly improve the performance of CBIR systems.

Keywords: *Content-based image retrieval (CBIR), relevance feedback (RF), support vector machines (SVM), graph embedding framework.*

Introduction

Content-based image retrieval (CBIR), as we see it today, is any technology that in principle helps organize digital picture archives by their visual content. By this definition, anything ranging from an image similarity function to a robust image annotation engine falls under the purview of CBIR. This characterization of CBIR as a field of study places it at a unique juncture within the scientific community. In the CBIR context, an image is represented by a set of low-level visual features, which are generally not effective and efficient in representing the image contents, and they also have no direct correlation with high-level semantic information. The gap between high-level information and low-level features is the fundamental difficulty that hinders the improvement of the image retrieval accuracy. Recently, a variety of solutions have been suggested that aim to bridge this semantic gap.

The relevance feedback [1] narrows the semantic gap by making use of user provided judgments which are the labels (relevant or non-relevant) on the retrieved images for a query. The retrieval performance improves as the user provides more and more feedback information to the CBIR system. Query vector modification (QVM) [2] and feature relevance learning [3] are the two widely used methods to integrate user feedback information into the CBIR system. Majority of the work uses relevance feedback to learn the relative importance of different features, with some tries to learn a feature weighting scheme either with [4] or without[5] considering correlations among feature components; while others either use a probabilistic scheme , or Self-Organizing Maps , or boosting technique , etc., to do so. A typical problem with CBIR system with relevance feedback is the relatively small number of training samples and the high dimension of the feature space. The system can only present the user with a few dozen of images to label (relevant or irrelevant).

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The interesting images to the user are only a very small portion of the large image database, in which most images remain unlabeled. Therefore, small sample learning methods are most promising for RF.

Two-class SVM is one of the popular small sample learning methods widely used in recent years and obtains the state-of-the-art performance in classification for its good generalization ability. Guo *et al.* developed a constraint similarity measure for image retrieval which learns a boundary that divides the images into two groups, and samples inside the boundary are ranked by their Euclidean distance to the query image. The SVM active learning method selects samples close to the boundary as the most informative samples for the user to label. It is almost impossible to estimate the real distribution of negative images in the database based on the relevant feedback. Nevertheless most of the SVM RF approaches ignore the basic difference between the two distinct groups of feedbacks, i.e all positive feedbacks share a similar concept (Fig1) while the negative feedbacks share a different concepts (Fig 2). Directly using SVM as an RF scheme damages the entire performance of CBIR systems. One problem is that different semantic concepts live in different subspace and it is the goal of RF schemes to figure out "which one". Additionally it has another problem of incorporating the unlabeled samples into traditional SVM based RF schemes, even though they are useful in constructing a good classifier.

Fig1. Set of negative feedback in RF iteration

Fig 2. Set of positive feedback in RF iteration

To explore solutions to the above problems, in this paper we propose a technology, biased maximum margin analysis (BMMA) and semi supervised BMMA (SemiBMMA) for the traditional RF scheme, based on graph embedding framework [30]. The proposed scheme is mainly based on the following: 1) effectiveness of treating positive and negative samples differently; 2) the success of graph embedding in characterizing intrinsic geometric properties of the data set in high dimensional space;

The convenience of graph embedding framework in constructing semi supervised learning techniques.

2. RELATED PREVIOUS WORK

i) SVM RF FOR CBIR SYSTEMS

Many relevance feedback methods have been developed in recent years. They either adjust the weights of various features to adapt to the user's preferences or estimate the density of the positive feedback examples. Regarding the positive samples and the negative samples as two difference groups and aiming at finding a classifier to identify these two groups from each other, relevance feedback in CBIR becomes a real-time classification problem. Among these classifiers, the Support Vector Machines (SVM) based relevance feedback (SVM RF) [6] has shown promising results owing to its good generalization ability. SVM has a very good performance for pattern classification problems by minimizing the Vapnik-Chervonenkis dimensions achieving a minimal structural risk. SVM active learning halves the image space each time in which the most positive samples are selected farthest from the classifier boundary on the positive side and the samples close to the boundary are deemed as the most informative ones for the user to label. Guo et al. [2] developed a constrained similarity measure (CSM) for image retrieval in which the SVM is also employed with AdaBoost. The CSM also learns a boundary that halves the images in the database into two groups and images inside the boundary are ranked by their Euclidean distances to the query. There are also some more kinds of SVM-based relevance feedback algorithms [3].

ii) GRAPH EMBEDDING FRAMEWORK

A unified view for understanding and explaining many popular algorithms such as PCA/LDA/LPP which may be used for linear techniques and ISOMAP/Laplacian Eigenmap/LLE which may be used for non-linear techniques. Graph embedding framework may be a platform for developing new dimension reduction algorithms.

Let the sample set be represented as

$$X = [x_1, \ldots x_N], x_i \in R^m$$

In this case often m is very large so there is a need to find the function F,intrinsic graph G and penalty graph $G^{p.}$

The function F can be represented as

$$F : x \mapsto y, y \in R^{m'}, m' << m$$

The intrinsic graph can be represented as

$$G = \{X, W\} \quad , W \in R^{N \times N}$$

The penalty graph can be represented as

$$G^P = \{X, W^P\} \quad , W^P \in R^{N \times N}$$

For a dimensionality reduction problem, direct graph embedding requires an intrinsic graph G , whereas a penalty graph G^P not a necessary input. The graph preserving criterion can be explained as

$$y^* = \arg\min_{y^T By = d} \sum_{i \neq j} \left\| y_i - y_j \right\|^2 W_{ij} = \arg\min_{y^T By = d} y^T Ly$$

$$L = D - W, D_{ii} = \sum_{i \neq j} W_{ij}$$

Where tr(.)is the trace of an arbitrary square matrix, C is a constant, and B is the constraint matrix. The Laplacian matrix L can be explained as $L=D^P{}_{-W^P}$

The graph-embedding framework preserves the intrinsic property of the samples in two ways. For larger similarity between samples x_i and x_j, the distance between y_i and y_i should be smaller to minimize the objective function. Conversely, smaller similarity between x_i and x_j, should lead to larger distance between y_i and y_j . Hence, through the intrinsic graph G and the penalty graph G^P, the similarities and the differences among vertex pairs in graph can be preserved in the embedding.

3. CBIR SYSTEMS

In experiments, we use a subset of the Corel Photo Gallery as the test data to evaluate the performance of the proposed scheme. Given a query image by the user, the CBIR system is expected to feed back more semantically relevant images after each feedback iteration. However, during RF, the number of the relevant images is usually very small because of the semantic gap. At the same time, the user would not like to label a large number of samples. The user also expects to obtain more relevant images with only a few rounds of RF iterations. Keeping the size of labeled relevant images small and keeping the RF iterations few are two key issues in designing the image retrieval system. Therefore, we devise the following CBIR framework accordingly to evaluate the RF algorithms.

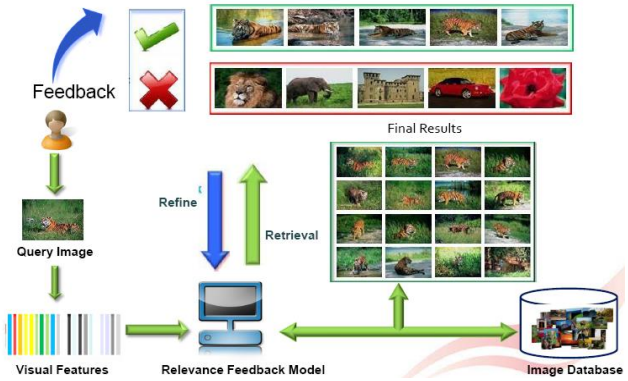

Fig 3 Framework of CBIR systems

Low-level image feature extraction is the basis of CBIR systems. To perform CBIR, image features can be either extracted from the entire image or from regions.

1. Image segmentation

Automatic image segmentation is a difficult task. A variety of techniques have been proposed in the past, such as curve evolution, energy diffusion, and graph partitioning. Many existing segmentation techniques work well for images that contain only homogeneous color regions, such as direct clustering methods in color space. These apply to retrieval systems working only with colors. Texture is an important feature in defining high-level concepts. As stated in [4] texture is the main difficulty in a segmentation method. Many texture segmentation algorithms require the estimation of texture model parameters which is a very difficult task. 'JSEG' segmentation overcomes these problems. Blobworld segmentation is another widely used segmentation algorithm. Some systems design their own segmentations in order to obtain the desired region features during segmentation, be it color, texture, or both.

The use of segmentation algorithm depends on the requirements of the system and the data set used. It is hard to judge which algorithm is the best.

2. Low-level image features

Many sophisticated feature extraction algorithms have been designed and good surveys are available. Here are the features with high-level semantics.

2.1 Color feature

Color feature is one of the most widely used features in image retrieval. Color spaces shown to be closer to human perception and used widely in RBIR include, RGB, LAB, LUV, HSV (HSL), YCrCb and the hue-min-max-difference (HMMD) . Common color features or descriptors in RBIR systems include, color-covariance matrix, color histogram, color moments, and color coherence vector. As the result, a set of viewpoint invariant color features have been computed.

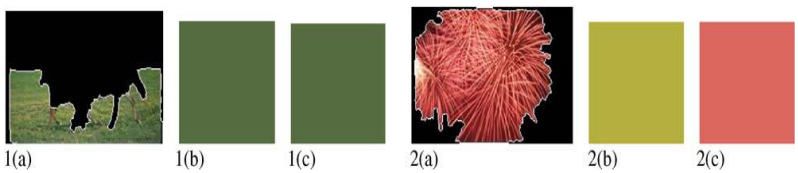

Fig. 4 Average color and dominant color: (a) original region; (b) average color; (c) dominant color.

2.2 Texture feature

Texture is not as well-defined as color features, some systems do not use texture features. However, texture provides important information in image classification as it describes the content of many real-world images such as fruit skin, clouds, trees, bricks, and fabric. Hence, texture is an important feature in defining high-level semantics for image retrieval purpose. Texture features commonly used in image retrieval systems include spectral features, such as features obtained using Gabor filtering [4] or wavelet transform, statistical features such as the six Tamura texture features and world features proposed by Liu et al.. Among the various texture features, Gabor features and wavelet features are widely used for image retrieval and have been reported to well match the results of human vision study. Gabor filtering and wavelet transform are originally designed for rectangular images. The Weber local descriptors (WLDs) are adopted as feature descriptors, which are mainly based on the human perception of pattern.

2.3 Shape feature

Shape is a fairly well-defined concept. Shape features of general applicability include aspect ratio, circularity, Fourier descriptors, moment invariants, consecutive boundary segments, etc.

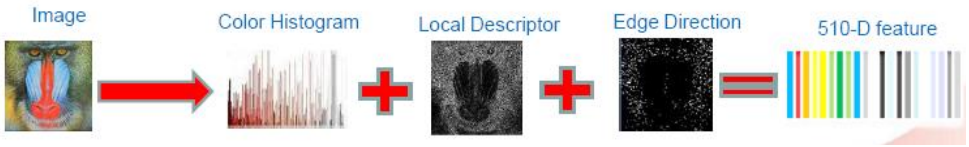

Fig 5 Image representations

Shape features are important image features though they have not been widely used as color and texture features. Shape features have shown to be useful in many domain specific images such as man-made objects. For color images used in most papers, however, it is difficult to apply shape features compared to color and texture due to the inaccuracy of segmentation. Despite the difficulty, shape features are used in some systems and has shown potential benefit for RBIR.

4. MAXIMUM MARGIN FOR SVM RF IN CBIR

After reviewing all the approaches of image retrieving process there are some pros and cons. So there is a need of effective method to solve the problem. In this paper we have used biased maximum margin.

Algorithm

1. Train the images into the database so that the images are categorized based on the content.
2. Input the query image that needs to be reported as output.
3. Color extraction process-

i) Convert the image from RGB to HSV.

ii) Calculate vector point.

iii) Apply biased maximum margin and perform training and mapping.

iv) Finally get the feature vector.

4. Texture extraction process-
i) Convert the input query image from RGB to grayscale.
ii) Calculate vector point.
iii) Apply biased maximum margin and perform training and mapping.
iv) Finally get the feature vector.

5. Shape extraction process

i) Convert the image and perform removal of background.

ii) Apply Weber local descriptor
iii) Apply biased maximum margin and perform training and mapping.
iv) Finally get the feature vector.
6. All the feature vector go to a feature space.
7. Similarity computation
i) Query image and the database image are viewed.
ii) If both the images are found to be similar then the results are produced to the user.
iii) If both the images are mismatched then the process is repeated until the user satisfied output is produced.

The two groups of feedbacks have different properties for CBIR with the observation that "All positive are alike and each negative samples are negative in its own way". To utilize the information of unlabelled samples in the database this paper introduces Laplacian regularizer to BMMA which will lead to semiBMMA for SVM RF.

Then the remaining images in the database are projected onto this resultant semantic subspace, and a similarity measure is applied to sort the images based on new representations. The major criterion in SVM based RFs is that the distance to the hyperplane of the classifier to differentiate the query relevant samples from the query irrelevant samples? After all the images are projected into subspace, all the positive feedbacks are clustered together while the negative feedbacks are separated from positive feedbacks by a maximum margin.

Therefore, the resultant classifier seems to be much simpler and better than that in the original high-dimensional feature space.BMMA aims to learn a projection matrix α such as that in the projected space all positive samples have high local within class similarity but the samples with different labels have high between-class separability. Here two graphs are constructed to show the similarity and dissimilarity i.e Intrinsic graph G, to show the similarity between positive feedbacks and the Penalty graph G^P, to show the dissimilarity between positive feedbacks and negative feedbacks. $L^u = D^u - W^u$ Can be known as a Laplacian matrix. Hence, we call this term as a Laplacian regularizer. There are a lot of possible ways to choose a regularizer for the proposed BMMA but we have chosen Laplacian regularizer, which is largely inspired by emerging manifold learning community. For the penalty graph G^P, its similarity matrix represents geometric properties to be avoided and is used as a constraint matrix in the graph embedding framework.

The BMMA algorithm optimizes the objective function in a trace difference form,

$$\begin{aligned}\alpha^* &= \arg\max_{\alpha} 2tr[\alpha^T X(D^P - W^P)X^T\alpha] - 2tr[\alpha^T X(D - W)X^T\alpha] \\ &= \arg\max_{\alpha} tr(\alpha^T XBX^T\alpha) - tr(\alpha^T XLX^T\alpha) \\ &= \arg\max_{\alpha} tr[\alpha^T X(B - L)X^T\alpha]\end{aligned}$$

This objective function works in two ways, i.e trying to maximize $\mathrm{tr}(\alpha^T XBX^T\alpha)$ and at the same time minimize $\mathrm{tr}(\alpha^T XLX^T\alpha)$. The difference between BMMA and MMC are the definitions of the interclass separability and infraclass compactness. In MMC, both the interclass separability and intraclass com-pactness are defined as the same in LDA, which treats the two different classes equally, and MMC can see only the linear global Euclidean structure. In BMMA, the intraclass compactness is constructed by only considering one class and characterized by a sum of the distances between each positive sample and its k_1 nearest neighbors in the same class. It should be noted that previous methods that followed MMC cannot be directly used for the SVM RF in image retrieval because these methods treat samples in different classes equally.

The solution to this problem is trivial. Therefore an arbitrary scaling factor has to be removed in the projection,

$$\max_{\alpha} tr(\alpha^{\mathrm{T}} X(B-L)X^{T}\alpha)$$

$$=\sum_{k=1}^{l} \alpha_k^{T} X(B-L)X^{T}\alpha_k$$

$$s.t.\ \ \alpha_k^{T}\alpha_k - 1 = 0,\ k = 1,2,\ldots,l$$

The other constraints such can be used but this also encounters "small size problem". This maximum margin approach can be compared with traditional MFA with the same constraint but when analyzing, it gives the difference that maximum approach involves a constrained approach, whereas the traditional MFA solves an unconstrained optimization problem. In order to solve the mentioned problem, this paper introduces a Lagragian, i.e.,

$$L(\alpha_k, \lambda_k) = \sum_{k=1}^{l} \alpha_k^T X(B-L)X^T\alpha_k - \lambda_k\left(\alpha_k^T\alpha_k - 1\right)$$

Lagragian L should be maximized with respect to both λ_k and α_k. The condition is that, at the stationary point, the derivatives of respect to α_k must vanish, i.e.,

$$\frac{\partial L(\alpha_k, \lambda_k)}{\partial \alpha_k} = \left(X(B-L)X^T - \lambda_k I\right)$$

$$\alpha_k = 0, \quad k = 1,2,\ldots,l$$

And therefore, $X(B-L)X^T\alpha_k = \lambda_k\alpha_k, \qquad k = 1,2,\ldots,l$

Which means that they $\lambda_k' s$ are the Eigen values of $X(B-L)X^T$ and $\alpha_k' s$ are the corresponding Eigen vectors. Thus, we have

$$J(\alpha) = \sum_{k=1}^{l} \alpha_k^T X(B-L)X^T\alpha_k = \sum_{k=1}^{l} \lambda_k\alpha_k^T\alpha_k = \sum_{k=1}^{l} \lambda_k$$

Therefore, the objective function is maximized when α is composed of the largest Eigen vectors of $X(B-L)X^T$. This allows us to avoid the "small sample size" problem easily.

CONCLUSION

BDA and its kernal version map were first proposed to address the asymmetry between the positive and negative samples in interactive image retrieval. However, to use BDA "small size problem" and Gaussian assumption are the two major challenges. Different from the original BDA, our BMMA algorithm is a local discriminant analysis approach, which does not make any assumption on the distribution of the samples.

Since the graph-embedding technique is an effective way to capture the intrinsic geometry structure in the original feature space, we propose a way to incorporate the unlabeled samples based on the intrinsic graph, which is helpful in capturing the manifold structure of samples and alleviating the over fitting problem.

This scheme can preserve weak (probably correct) similarities between all unlabeled sample pairs and thus effectively integrate the similarity information of unlabeled samples into BMMA. After all the projection of images has been completed, the traditional SVM RF is executed on the new representations.

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A REVIEW PAPER ON EARLY DIAGNOSIS OF ALZHEIMER'S DISEASE (AD) THROUGH PROFILING OF HUMAN BODY PARAMETERS

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Abstract: Geratology deals with the many clinical problems that are common in the elderly population, and many of these follow the orthodox pattern of clinical practice. Patients characteristically have poor insight and often attribute their early symptoms of amnesia to normal ageing. Alzheimer's disease (AD) is common form of senile dementia. There are several causes for the disease. Although our understanding of the key steps underlying neurodegeneration in Alzheimer's disease (AD) is incomplete, it is clear that it begins long before symptoms are noticed by patient. Any disease – modifying treatments which are developed are most likely to be successful if initiated early in the process, and this requires that we develop reliable, validated and economical ways to diagnose Alzheimer's−type pathology. In this case, the use of advanced biomedical engineering technology will definitely helpful for making diagnosis successfully. Profiling of human body parameter using computers can be utilised for the successful early diagnosis of Alzheimer's disease. There are several neuroimaging techniques used in clinical practice for the diagnosis of Alzheimer's – type pathology. Prominent of them are Magnetic Resonance Imaging Scan (MRI), Positron Emission Tomography (PET) and Single−Proton CT Scanning (SPECT).In this research work, it is planned to investigate techniques for the early diagnosis of Alzheimer's disease (AD) with the help of various laboratory tests and neuroimaging techniques.

***Keywords*:** Alzheimer Disease (AD), neurodegeneration, MRI,SPECT,PET

1 INTRODUCTION

Alzheimer's disease (AD) is an irreversible age related neurodegenerative disorder of the brain that leads to memory loss and impairs the ability to perform routine functions as well[1]. Alzheimer's disease was discovered in 1906 by Alois Alzheimer, a German neurologist and psychiatrist [2]. At present nearly 36 (35.6) million people are believed to be living with Alzheimer's disease or other dementias, increasing to nearly 66 (65.7) million by 2030 and more than 115 (115.4) million by 2050[3]. The number of people with dementia will double by 2030, and more than triple by 2050[4]. The progression of the disease can be categorized in four different stages. The first stage is known as Mild Cognitive Impairment (MCI), and corresponds to a variety of symptoms (most commonly amnesia) which do not significantly alter daily life. Between 6 and 25% of people affected with MCI progress to AD every year. The next stages of Alzheimer's disease (Mild and Moderate AD) are characterized by increasing cognitive deficits, and decreasing independence, culminating in the patient's complete dependence on caregivers and a complete deterioration of personality (Severe AD) [5]. Alzheimer's disease is the sixth-leading cause of death and is 70% prevalent in all cases of dementia[6]. According to another report every 71 sec, someone develops Alzheimer's disease and the rate doubles roughly every 10 years after age 65 [7]. The most well-known neuropathological hallmarks of AD are extraneuronal senile plaques and intraneuronal neurofibrillary tangles (NFTs). Neurofibrillary tangles are filamentous bundles in cytoplasm of the neurons displacing or encompassing nucleus.

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In the pyramidal cells, they appear as 'flame' while in rounder cells they appear as 'globos tangles' [8]. Senile (neuritic) plaques present outside the neuron, appear as spherical bodies bearing dilated and tortuous neuritic processes around an amyloid beta core which contains some abnormal proteins like amyloid beta plaques which are derived through the processing of Amyloid Precursor Protein (APP) [8,9]. Familial causes or genetic mutations involved in disease pathology include mutations on chromosomes 21, 14 and 1. Risk factors for AD are advanced age, lower intelligence, small head size, history of head trauma and female gender [10,11]

2 RISK FACTORS OF AD

The genetic risk in familial early-onset AD differs from that in the sporadic late-onset form of the disease. In the familial disease, the three genes implicated are all autosomal dominant, and include the amyloid precursor protein gene on chromosome 21, the presenilin 1 gene on chromosome 14, and the presenilin 2 gene on chromosome 1. Presenilin 1 gene mutations are most common among familial AD mutations[12]. Mutations in these genes lead to an overproduction of beta-amyloid (Aβ) peptides (Aβ40 and Aβ42), which give rise to synaptic dysfunction, neurotoxicity, and Aβ deposits in the brain called neuritic or senile plaques. But in early-onset AD, is rare[12,13] In sporadic or late-onset AD, the apolipoprotein-E (APOE) ε4 allele increases the risk of developing the disease[12]. As a susceptibility gene, the genotypes APOE ε2/ε4 or ε3/ ε4 increase the risk by approximately three-fold, and the genotype APOE ε4/ε4 increases the risk by approximately 15-fold. The population-attributable risk (ie the proportion with late-onset AD associated with APOE) is estimated to be 20%, making it the most important risk factor[12,14].The APOE allelic variants may be involved in the degradation or clearance of Aβ from the brain. Genome-wide association (GWA) studies and a recent meta-analysis of 12 GWA studies implicated three additional genes, namely the complement receptor 1 (CR1), clusterin(CLU), and phosphatidylinositol binding clathrin assembly protein (PICALM), which are novel susceptibility loci for late-onset AD in European ancestry populations[15].

Age is another risk factor for AD. The annual incidence of AD is approximately 1% among elderly persons aged 65 to 70 years, and increases to 6 to 8% of persons older than 85 years. The prevalence of AD is below 1% for persons aged 60 to 64 years, and increases with age to 24 to 35% among persons aged 85 years or above, and is higher in women than men [12,16,17,18]. In men, high bioavailable testosterone levels appear to reduce the risk of AD[19]. Education may increase the 'cognitive reserve', which reduces the risk of late-life dementia. The risk of AD is highest among those with low or limited levels of education. A positive family history of AD occurs in around 15% of AD patients, and increases the risk of AD approximately four-fold[12]. The relationship of alcohol use to AD follows a U-shaped relationship; moderate consumption is associated with a reduced risk, whilst in heavy drinkers and non-drinkers the associated risk of cognitive impairment, dementia, and AD appears to be increased. The protective effect of moderate alcohol intake may be related to the antioxidant properties of wine[12,20]. Physical activity and exercise reduce brain tissue loss, dementia, and the risk of AD, possibly via increased neurotrophic factors[21]. Smoking increases the risk 2 to 4 times. Depressive mood and cardiovascular risk factors are also associated with an increased risk[12]. Severe head injury also increases the risk of AD, possibly via reduced brain reserve or increases in brain Aβ deposition. Other dietary factors may also reduce the risk of AD, including vitamin B12; folate; antioxidants including flavonoids; vitamins C and E; unsaturated fatty acids; and a Mediterranean diet pattern[12,22]. There is a strong link between cardiovascular health and brain health. Having heart disease, high blood pressure or high cholesterol can increase the risk of developing AD. This is caused by damage to blood vessels in the brain, resulting in less blood flow and possible brain tissue death. Type 2 diabetes may also increase the risk for AD. Inefficiency of insulin to convert blood sugar to energy may cause higher levels of sugar in the brain, causing harm.

3 HALLMARKS OF AD

A definite diagnosis of Alzheimer disease can be made only by autopsy examination of a patient's brain. This neuropathological evaluation reveals gross cerebral atrophy, signifying loss of neurons. The diagnostic lesions are found on microscopic evaluation of the most affected areas of the brain, which reveal the presence of large numbers of extracellular neuritic plaques and intracellular neurofibrillary tangles, which are shown in Fig 1. Plaques and tangles are found predominantly in the frontal and temporal lobes, including the hippocampus. In more advanced cases, the pathology extends to other regions of the cortex, including the parietal and occipital lobes. Plaques are insoluble extracellular deposits composed mainly of a 40–43 amino acid peptide called β-amyloid (Aβ). Aβ derives from a larger protein, β-amyloid precursor protein (APP) by proteolytic processing. Plaques can be described as diffuse or classical. Diffuse plaques are amorphous aggregates of Aβ which are typically not associated with dystrophic neurons and abnormal neurites. Classical neuritic plaques contain densely aggregated Aβ and are generally associated with degeneration and neuronal cell loss. Because soluble β-

amyloid aggregates spontaneously into fibrils that are indistinguishable from those found in vivo, it is thought that plaques result from raised Aβ levels. Patients with Alzheimer disease also have an increased coincidence of cerebrovascular disease, possibly related to deposition of amyloid within the cerebral vasculature, which occurs in most cases. In early-onset familial AD, excessive Aβ is formed.

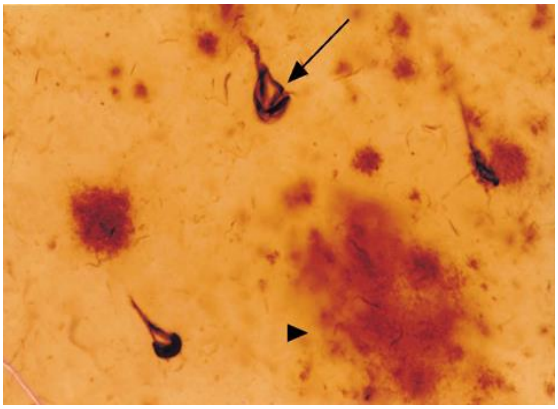


Fig1*: Light micrograph of Alzheimer disease neuropathology. Section from the cortex of a patient with Alzheimer disease showing tangles and plaques. The intraneuronal tangle (arrow) is stained dark brown with an antibody that specifically targets paired helical filaments. These filaments are also seen as the dense brown material (dystrophic processes) embedded in the extracellular plaque (arrowhead). The lighter reddish staining of the plaque is from another antibody directed specifically against β-amyloid (Aβ).*

In late-onset AD, there is reduced clearance of the usual amounts of Aβ. The excess Aβ aggregates to form soluble dimers, trimers, and low-ordered molecules called oligomers. Further aggregations into Aβ protofibrils, fibrils and neuritic plaques may also occur. While all these forms of Aβ aggregates account for neuronal dysfunction and neuronal death in AD, Aβ oligomers are particularly toxic to the neuron. In AD, the second neuropathological hallmark is an intraneuronal accumulation of abnormally hyperphosphorylated tau(τ) (ie described as the tau hypothesis). Apparently, this impairs normal transport function and causes aggregation of the tubules to form NFTs within the neuronal cell in the transentorhinal regions, hippocampus, amygdala, and then neocortical association areas. Tangles are intracellular deposits of the microtubule associated protein tau (τ) found within dystrophic neurons. Tau is normally found in great abundance in neurons, where it binds tubulin monomers together to form stable polymers that are presumed to be essential in cellular transport and axonal growth. In Alzheimer disease tangles, the tau becomes hyperphosphorylated and this leads to less efficient binding to microtubules. The unbound tau then spontaneously aggregates into insoluble paired-helical filaments, which are seen as deposits in the neurons. While plaques and tangles do occur in normal ageing brains, they are more numerous and more widely distributed in brains of patients with Alzheimer disease. The determination of whether plaques and tangles cause neuronal degeneration or are simply markers of it is essential for designing effective treatment strategies

Although the role of plaques and tangles in Alzheimer disease is still not known precisely, they are found in greatest abundance in the areas of the brain most affected in Alzheimer disease, namely the hippocampus, parietooccipital cortex, temporal cortex and frontal cortex. The hippocampi are small sea-horse-shaped structures nestled in the temporal lobes, which play a central role in establishing and maintaining memory. The hippocampi show the earliest changes in Alzheimer disease and have the greatest concentration of plaques and tangles. This finding corresponds to the early and progressive symptoms of memory loss in patients with Alzheimer disease. The development of plaques and tangles in cortical areas correspond to the other clinical findings seen in Alzheimer disease, including abnormal visuospatial orientation, difficulty with skilled tasks and language abnormalities. The progressive loss of neurons and neuronal interconnections, known as synapses, is associated with decreased concentrations of neurotransmitters, the chemical signals that are sent between neurons. One such neurotransmitter is acetylcholine, the decline of which is hypothesized to be one of the factors responsible for the intellectual deterioration seen in both normal ageing and in Alzheimer disease. There is a dramatic decrease in the levels of choline acetyltransferase, the enzyme needed for the synthesis of acetylcholine, in Alzheimer disease brains as compared with controls. For this reason, there has been much interest in developing drugs that increase the level of acetylcholine in the brain as a treatment for Alzheimer disease.

4 EARLY DIAGNOSIS OF AD

While much has been accomplished in Alzheimer disease research in the last 20 years, a great deal remains to be done to improve its diagnosis and treatment. There is increasing evidence that early diagnosis of Alzheimer disease will be key to maximizing treatment benefits. But too often, patients are diagnosed in later stages of the disease, when disabling symptoms and neuropathologic changes have become well established. AD affects a considerable and increasing part of the population. Despite the lack of disease-modifying treatment at present, discovering sensitive and specific markers of early AD would be a major breakthrough as it would allow us to slowdown or perhaps even arrest the degenerative process before dementia develops. Furthermore, current symptomatic treatments, such as acetylcholine esterase inhibitors, may be more efficient when administered in the early stages of AD. However, early diagnosis remains difficult to achieve, and currently the clinical diagnosis of AD comes relatively late into the disease. The difficulties lie for the most part in the similarities between cognitive impairment due to normal aging processes and initial manifestations of AD. The diagnosis of clinically probable AD can currently be made in living subjects only once the stage of dementia has been reached. It is based on a number of criteria as defined by the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) and the Alzheimer's Disease and Related Disorders Association (ADRDA), but can only be confirmed by postmortem histopathology. While the clinical signs of AD are well established, the early symptomatic and predementia stage remains to be better defined.

In practice, a clinical diagnosis of AD is made when patients have progressive memory decline for over 6 months with a resulting impairment of selfcare and social or occupational functioning. The presence of objective memory impairment should be documented by the Mini-Mental State Examination (MMSE) and other neuropsychological tests. Other essential diagnostic points include deficits in two or more areas of cognition, absence of disturbance in consciousness, disease onset between the ages of 40 and 90 years, absence of systemic disorders or other brain diseases that could account for the progressive deficits in memory and cognition, evidence of cerebral atrophy on computed tomography (CT) or magnetic resonance imaging (MRI) without other significant organic lesions, and absence of any metabolic disorder [23]. In most patients, the above information can be obtained after a detailed history from the carers, physical examination, and cognitive tests that measure memory, language skills, and activities of daily function related to brain functioning. An early, accurate diagnosis of AD is especially important to patients and their families. It helps them plan for the future and pursue management options, while the patient can still take part in making decisions. During the diagnostic process, it is also crucial to rule out other causes of cognitive decline, particularly other types of dementia. Vascular dementia, frontotemporal dementia, and Lewy body dementia need to be considered as possible subtypes in the differential diagnoses. Structural neuroimaging (CT or MRI) can help rule out the presence of strokes, subdural haematoma, normal pressure hydrocephalus or tumours. Serum vitamin B12 level, red blood cell and serum folate levels can help exclude these deficiencies. Abnormalities in these tests, however, are quite common in elderly persons, and may or may not be causal. Less common causes of dementia are hypothyroidism, neurosyphilis, and sedation from drugs. If the clinical history raises suspicions, chronic heavy metal intoxication (eg mercury), human immunodeficiency virus infection, and Creutzfeldt-Jakob disease have to be considered. Overall, AD accounts for 65% of all patients with dementia, while secondary causes explain a minority [17]. Vascular dementia (VaD) and mixed AD-VaD are usually the second and third most common causes, respectively. In general, this clinical approach is often employed in conjunction with established diagnostic criteria for AD, including those in the Diagnostic and Statistical Manual of Mental Disorders (4th edition) and the National Institute of Neurological and Communicative Disorders and Stroke/Alzheimer's Disease and Related Disorders Association criteria for AD[23,24]. Using the latter criteria, the term "probable AD" is equivalent to the clinical diagnosis of AD during a lifetime, as definite AD can only be only made at postmortem.20 experienced clinicians can diagnose AD with approximately 90% accuracy. The addition of biomarkers, in particular, amyloid (eg Pittsburgh compound B or PiB) positron emission tomography (PET) and fluorodeoxyglucose (FDG) PET brain scans can further improve diagnostic accuracy (Figs 2 and 3).

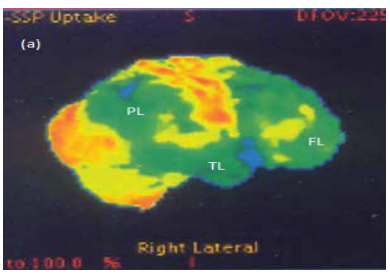
4.1 BIOMARKERS OF AD

Alzheimer's disease is now regarded as a chronic disease. Affected patients have neuropathology in their brains for over 10 to 20 years before symptoms occur. With ongoing research to develop new AD treatments, an increasing need to establish an early diagnosis of AD could become important. Thus, biological markers which

could allow a positive diagnosis early in the course of AD appear desirable. Amyloid PET brain imaging and low cerebrospinal fluid (CSF) Aβ42 levels constitute neuropathological biomarkers, reflecting Aβ protein deposition in the brain. The second group of biomarkers reflects neuronal degeneration, injury, and brain atrophy. These biomarkers include structural MRI regional brain atrophy (in the hippocampus, medial, basal and lateral lobes, and the parietal lobe), decreased [^{18}F]FDG PET uptake in the temporoparietal cortex, and increased CSF tau protein levels, ie total tau (t-tau)and phosphorylated tau (p-tau)[25]. Quantitative volumetric brain MRI can differentiate AD from healthy elderly persons, with over 80% accuracy[26]. Semi-quantitative visual hippocampal assessment categorises hippocampal atrophy into five grades, and is also helpful with its diagnostic sensitivity of 81% and specificity of 67% [27].Functional imaging by PET or single photon emission computed tomography (SPECT) can evaluate brain function. [^{18}F]FDG PET is used to measure the brain metabolic energy, while 99mTc hexa methyl propyleneamine oxime is commonly used to study cerebral perfusion. In AD patients, the characteristic change in FDG PET brain scans is bilateral hypometabolism of the superior posterior temporal and parietal lobes. In very early or mild cognitive impairment due to underlying AD pathology, FDG PET brain scans reveal hypometabolism in the medial part of the parietal cortex (posterior cingulate). In advanced AD, bilateral frontal lobe hypometabolism is also present, in addition to the characteristic hypometabolism of the temporoparietal areas (Fig 2). The sensitivity and specificity of FDG PET brain scans in the diagnosis of AD are 93% and 63%, respectively. Although SPECT brain scan is less sensitive than FDG PET, it can demonstrate the temporoparietal and posterior cingulate hypoperfusion in AD patients. The sensitivity and specificity of SPECT brain scan for the diagnosis of AD are 63% and 93%, respectively[28]. Amyloid PET brain scans can detect Aβ deposit in the brain of AD patients in vivo. The most extensively reported technique is the [^{11}C]PiB PET brain scan. In AD patients but not in cognitively normal elderly persons, PiB is deposited bilaterally in the frontal, parietal, temporal, and occipital cortices (Fig 3). This pattern concurs with Aβ deposits in post-mortem brain studies. In the presence of dementia, a positive PiB PET brain scan confirms the diagnosis of AD as the cause[28,29]. However, a positive PiB PET brain scan can also be found in 10 to 30% of cognitively normal elderly persons. This is not surprising, as amyloid deposits have been reported in autopsied brains of elderly persons without dementia,which may represent a pre-clinical stage of AD at a time when the cognitive function is still unimpaired [29]. In previous studies, it was found that elderly persons without dementia but high PiB positive scans have increased risks of cognitive decline and developing AD on follow-up[30,31,32]. Brain scans using PiB PET and MRI are reported to be complementary in providing neuropathological and neuronal degeneration information, respectively [32]. A low CSF Aβ42 level is an alternative evidence of amyloid deposition which supports the diagnosis of AD. High CSF levels of t-tau or p-tau indicate neuronal degeneration and also support the diagnosis[25,33] The combination of CSF Aβ42 and t-tau or p-tau (ie the ratio of either t-tau/Aβ42 or p-tau/Aβ42) has a higher sensitivity and specificity than either tau or Aβ42 alone in differentiating AD from normal or other neurological diagnoses. The p-tau/ Aβ42 ratio is the best CSF biomarker to differentiate AD from frontotemporal dementia and semantic dementia, with a sensitivity of approximately 92% and 98%, respectively, and a specificity of approximately 93% and 84%, respectively[34]. In patients with mild cognitive impairment, the combination of t-tau and the p-tau/Aβ42 ratio can also predict subsequent development of AD, with a sensitivity of 83 to 95% and a specificity of 87 to 88%[35,36].

4.2 NEUROIMAGING TECHNIQUES

Neuroimaging is being increasingly used to complement clinical assessments in the early detection of Alzheimer's disease (AD). Structural magnetic resonance imaging (MRI) and metabolic positron emission tomography (FDG-PET) are the most clinically used and promising modalities to detect brain abnormalities in individuals who might be at risk for AD but who have not yet developed symptoms. Primary has been the detection of the brain signature of AD relative to normal elderly controls, followed by the differential diagnosis of AD from other neurodegenerative diseases , and finally longitudinal imaging studies of disease progression.



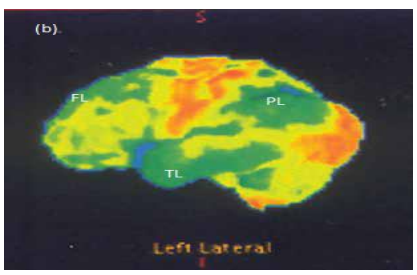


FIG 2. *Fluorodeoxyglucose positron emission tomography (FDG PET) brain scan in Alzheimer's disease (AD) Brain FDG PET scan in moderately severe AD: bilateral symmetrical hypometabolism affecting temporal (TL), parietal (PL), and frontal (FL) lobes*

The goal of the early MRI and FDG-PET studies in AD was to identify general evidence for brain damage that was specifically associated with AD and with the severity of the clinical symptoms. MRI studies in AD patients have shown that cortical atrophy occurs in defined sequences as the disease progresses, comparable to the pattern of NFT accumulation observed in cross section at autopsy[37]. Most MRI studies show that severe entorhinal cortex and hippocampal atrophy is consistently found in mild AD patients[38,39,40]

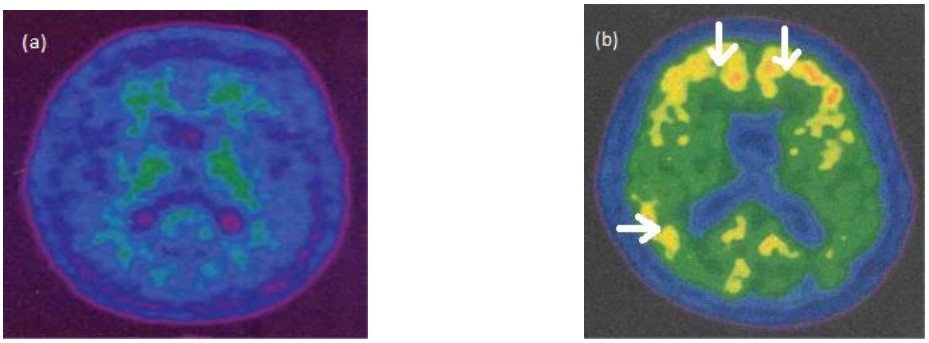


FIG 3. *Pittsburgh compound B (PiB) positron emission tomography (PET) brain scan in Alzheimer's disease (AD) and normal controls (a) Normal older adults without AD: PiB-negative, with no PiB retention in cerebral cortex. (b) AD patient: PiB-positive (white arrows), with moderate PiB retention in frontal and parietal cortices*

Whereas volume reductions in the cortical regions, particularly parieto-temporal, posterior cingulate/presumes, and frontal cortices, become apparent in moderate to severe AD.There is evidence that the volume loss detected on MRI is related to both the extent of NFT pathology and to the magnitude of neuronal loss [41,42]. As neuronal degeneration and the formation of insoluble amyloid deposits and neuritic tangles gradually progress, AD pathology is known to have the general effect of disrupting axonal transport and inducing widespread metabolic declines. On FDG-PET examinations, AD patients present with severe reductions in the rate of brain glucose consumption as compared to normal, which reflects decreased synaptic functioning and density.Virtually all FDG-PET studies report that, as compared to age-matched healthy normal controls, AD patients show regional metabolic reductions involving the parieto-temporal and posterior cingulate cortices, and the frontal areas in advanced disease. These regional metabolic reductions are present upon a background of widespread global metabolic impairment and in comparison to the relatively spared primary motor and visual areas, cerebellum, thalamus and basal ganglia nuclei[43].With increasing technical improvements leading to high spatial resolution scanners and improved detector sensitivity of PET instrumentation, there also appeared reports of hippocampal metabolic abnormalities in AD along with the typical cortical hypometabolism. These findings have been largely replicated since the early 1980's, and this pattern of hypometabolism is now accepted as a reliable in vivo hallmark of AD, because of its high sensitivity in distinguishing AD from normal aging as well as from other diseases that affect the brain regionally and globally. MRI exams are now routinely requested during the clinical work-up diagnosis. After clinical examinations and routine laboratory tests are completed, the physician usually orders a structural imaging examination, i.e. CT or MR scan of the brain. Such images are recommended and used to rule out other possible common causes of dementia, such as brain tumor, normal pressure hydroencephalus, and vascular lesions FDG-PET has been recently approved by the Centers for Medicare & Medicaid Services (CMS, USA) as a routine examination tool in support of the clinical and differential diagnosis of AD. The hope is that neuroimaging evaluations would improve the detection of AD at very early stages.

5 RECENT ADVANCES IN AD RESEARCH

Current diagnosis of Alzheimer's relies largely on documenting mental decline. Researchers hope to discover an easy and accurate way to detect Alzheimer's before these devastating symptoms begin. Experts believe that biomarkers offer one of the most promising paths. Biomarkers are reliable predictors and indicators of a disease process. Biomarkers include proteins in blood or spinal fluid, genetic variations (mutations) or brain changes detectable by imaging. Researchers are also investigating whether presymptomatic Alzheimer's disease causes consistent, measurable changes in urine or blood levels of tau, beta-amyloid or other biomarkers. In addition,

scientists are exploring whether early Alzheimer's leads to detectable changes elsewhere in the body. For example, Lee Goldstein, MD, PhD, has been funded by the Alzheimer's Association to investigate whether beta-amyloid forms characteristic deposits in the lens of the eye. Neuroimaging is among the most promising areas of research focused on early detection. Today, a standard workup for Alzheimer's disease often includes structural imaging with magnetic resonance imaging (MRI) or computed tomography (CT). These tests are currently used chiefly to rule out other conditions that may cause symptoms similar to Alzheimer's but require different treatment. Structural imaging can reveal tumours, evidence of small or large strokes, and damage from severe head trauma or a build-up of fluid in the brain. Preliminary research suggests that emerging imaging technologies and new applications of current technology may be able to detect hallmark changes associated with Alzheimer's disease in the brains of living individuals. If further research confirms the potential value of brain imaging, its use may one day be expanded to play a more direct role in diagnosing Alzheimer's and in earlier detection of the disease. Structural imaging studies have shown that the brains of people with Alzheimer's shrink significantly as the disease progresses. Research has also shown that shrinkage in specific brain regions such as the hippocampus may be an early sign of Alzheimer's. However, scientists have not yet agreed upon standardized values for brain volume that would establish the significance of a specific amount of shrinkage for any individual person at a single point in time. Functional imaging research with positron emission tomography (PET) and other methods suggests that those with Alzheimer's typically have reduced brain cell activity in certain regions. For example, studies with fluorodeoxyglucose (FDG)-PET indicate that Alzheimer's disease is often associated with reduced use of glucose (sugar) in brain areas important in memory, learning and problem solving. However, as with the shrinkage detected by structural imaging, there is not yet enough information to translate these general patterns of reduced activity into diagnostic information about individuals. Molecular imaging technologies are among the most active areas of research aimed at finding new approaches to diagnose Alzheimer's in its earliest stages. Molecular strategies may detect biological clues indicating Alzheimer's is under way before the disease changes the brain's structure or function, or takes an irreversible toll on memory, thinking and reasoning. Molecular imaging compounds currently used in Alzheimer research include:Pittsburgh compound B (PIB) and18F flutemetamol (flute**)**.The Alzheimer's Association helped fund early PIB development. The Association in 2006 also awarded a $2.1 million grant to the Researchers are also investigating whether presymptomatic AD causes consistent, measurable changes in urine or blood levels of tau, amyloid-β or other biomarkers.

6 CONCLUSION

There are a lot of clinical tests, drug therapies and diagnostic tools such as biomarkers and neuroimaging techniques are available for the diagnosis of Alzheimer’s disease. But the fact is that these techniques are inadequate for the definite diagnosis at the earlier stages. So a newly reliable and efficient method should be developed in order to diagnose the disease with the advanced biomedical engineering technology using the aid of various clinical tests, neuroimaging techniques such as SPECT, MRI and PET. These techniques can be useful to a great extent for the profiling of human body parameters which are the main hallmarks of the disease.

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AN EFFICIENT IMPLEMENTATION OF FPGA BASED FACE DETECTION AND FACE RECOGNITION SYSTEM USING HAAR CLASSIFIERS

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ABSTRACT

This paper introduces a novel techniqueto detect faces similarly recognizes in real-time with very high rate. It is essentially a feature-based approach, in which a classifier is trained for Haar-like rectangular features selected by AdaBoost algorithm and efficient representation method histogram equalization is usedfor varying illumination in the image. The facedetection system generates an integral image window to perform a Haar feature classification during one clockcycle. And then it performs classification operations inparallel using Haar classifiers to detect a face in the image sequence. The classifiers in the beginning of the cascade are simpler and consist of smaller numbers of features. Although a face detection module is typically designed to deal with single images, its performance can be further improved if video stream is available **.** However, as one proceeds in the cascade, the classifiers become more complex. A region is reportedas detection only if it passes all the classifier stages inthe cascade. If it is rejected at any stage, it is discardedand not processed further. If all stages are passed the face of a candidate is concluded to be recognized face.

Key Words – *AdaBoost algorithm, haar features, histogram equalization, integral image.*

I. INTRODUCTION

Computer vision is one of the foremost fields which have experienced increasing number of applications in the recent years in various directional domains like biomedical imaging, surveillance systems, interactivesystems like gesture, recognition, gaming etc.Detection of human faces is one of the key elements in the applications of computer vision in the above mentioned domains. Face detection is based on identifying and locating a human face in image regardless of size, position, and condition. Numerous approaches have been proposed for face detection in images. Simple features such as color, motion, and texture are used for the face detection in early researches. However, these methods break down easily because of the complexity of the real world. Face detection proposed by Viola and Jones [1]is most popular among the face detection approachesbased on statistic methods. This face detection is avariant of the AdaBoost algorithm [2] which achieves rapid and robust face detection. The proposed facedetection framework based on the AdaBoost learning algorithm using Haar features with varying illumination is considered one of the most difficult tasks for face detection. Variation caused by illumination is highly non linear and makes task extremely complex. Well known one is contrast enhancement algorithm, histogram equalization is applied for compensating the

illumination conditions. Over past two decades, the problem of face detection has attracted substantial attention and witnessed an impressive growth in basic and applied research, product development and application.

The purpose of this paper is to implement and thereby recreate the face detection algorithm presented by Viola-Jones with a refinement of histogram equalization technique. This algorithm should be capable of functioning in an unconstrained environment meaning that it should detect all visible faces in any conceivable image. In order to guarantee optimum performance of the developed algorithm thevast majority of images used for training, evaluation and testing are either found on the internet or taken from private collections.

A. Overview

Facial feature detection methods generally modeltwo types of information. The first is local texturearound a given feature, for example the pixel values in a small region around an eye. The second is thegeometric configuration of a given set of facial features, e.g. eyes, nose, mouth etc.This paper encloses four main contributions of ourface detection framework. We will introduce each ofthese ideas briefly below and then describe them indetail in subsequent sections comprising, will discuss the various composition required for facedetection: integral image, haar features, adaboostalgorithm and histogram equalization. Section 3 will specifically discuss proposed hardware architecture.Section 4 deals with the implementation and experimental results.

COMPOSITION REQUIRED FOR FACEDETECTION

A. Integral Image

Integral images can be defined as two-dimensionallookup tables in the form of a size of the original image .This allows to computesum of rectangular areas in the image, at any positionor scale, using only four lookups ill (1)

Sum=pt4 - pt3 - pt2+ ptl (1)

where points p1" belong to the integral image.The new image representation called integralimage paves way for fast feature evaluation [3]. Theintegral image at location (x, y) contains the sum ofthe pixels above and to left of (x, y), as shown in figure 1.

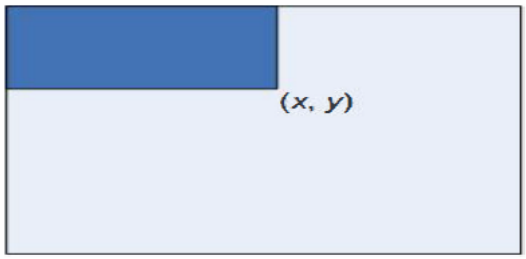


Figure 1. The shaded region represents the sum of pixels up to the position (x, y) of the image.

The shaded region represents the sum of pixels up tothe position (x, y) of the image.Using the integral image any rectangular sum canbe computed in four array references [4], figure 2illustrates the integral image sum

generation, the sumof the pixels within rectangle D can be computedwith four array references. The value of the integralimage at location 1 is the sum of the pixels inrectangle A. The value at location 2 is A + B, atlocation 3 is A + C, and at location 4 is A + B + C +D. The sum within D can be computed as 4 + 1 - (2+ 3).

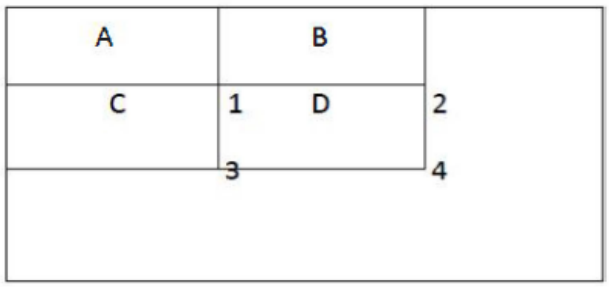


Figure2. Rectangular sum computation.

B. Haar Features

Haar-like features are digital image features usedin face detection. They owe their name to theirintuitive similarity with Haar wavelets and were usedin the first real-time face detector [5]. A Haar-likefeature considers adjacent rectangular regions at aspecific location in a detection window as indicatedin figure 3, it sums up the pixel intensities in theseregions and calculates the difference between them.This difference is then used to categorize subsections of an image. For example, let us say we have animage database with human faces. It is a commonobservation that among all faces the region of theeyes is darker than the region of the cheeks.Therefore a common haar feature for face detection isa set of two adjacent rectangles that lie above the eyeand the cheek region. The position of these rectanglesis defined relative to a detection window that acts likea bounding box to the target object (the face in this case).

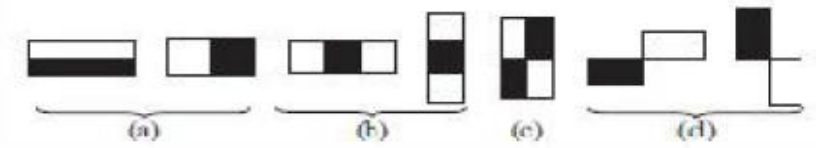


Figure 3. Examples of haar features.

C. Haar Features Calculation

Haar features are composed of either two or threerectangles. Face candidates are scanned and searchedfor Haar features of the current stage. The weight andsize of each feature and the features themselves aregenerated using a machine learning algorithm fromAdaBoost [6]. Each Haar feature has a value that iscalculated by taking the area of each rectangle,multiplying each by their respective weights, andt hen summing the results. Several Haar featurecompose a stage. A stage comparator sums the entire Haar feature resulting in a stage and compares this summation with a stage threshold. The threshold is aconstant obtained from the AdaBoost algorithm [7]. The face detection algorithm eliminates facecandidates quickly using a cascade of stages. Thecascade eliminates candidates by making stricterrequirements in each stage with later stages being much more difficult for a c ndidate to pass.Candidates exit the cascade if they pass all stages or fail any stage. A face is detected if a

candidate passesall stages. This process is shown in Figure 4.Candidate must pass all stages in the cascade to be concluded as a face.

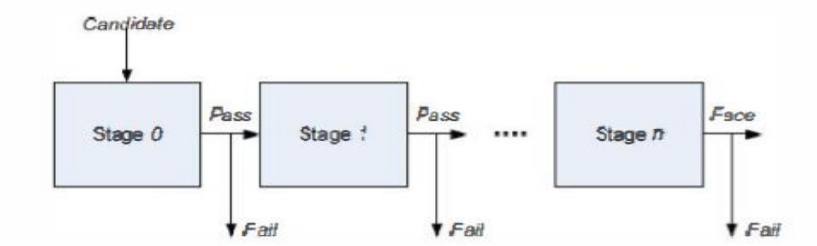


Figure 4. Cascade of stages.

D. Adaboost Algorithm

AdaBoost, short for Adaptive Boosting, is amachine learning algorithm, formulated by YoavFreund and Robert Schapire [8].The adaboostalgorithm is based on the idea that a strong classifiercan be created by linearly combining a number ofweak classifiers. A weak classifier consists of a feature (j), a thres hold (θ), and a polarity (P)indicates the direction of the inequality:

$$h(x,f,p,\theta) = \begin{cases} 1 \ if \ pf(x) < p\theta \\ 0 \ otherwise \end{cases} \quad (2)$$

In the boosting algorithm T hypotheses are constructed each using a single feature.The finalhypothesis is a weighted linear combination of the Thypotheses where the weights are inverselyproportional to the training errors. Each iteration t, itwill train a best weak classifier which can minimizesthe training errors. After T iteration, we can obtain astrong classifier which is the linear combination ofthe T best weak classifiers multiplied by the weight values. The AdaBoost algorithm is used to select a set of features and train a classifier. Locating such featuresis an important stage in many facial image Interpretation tasks (such as face verification, face tracking or face expression recognition). We adopt the fast and efficient face finder recently described by Viola and Jones to locate the approximate position of each face in an image. A detector is used to cascade the structure to reduce the number of features considered for each sub-window. We then use the same method, trained on regions around facial feature points, to locate interior points on the face. However, there is often insufficient local structure around eachfeature to train really reliable feature finders. We find that when set with thresholds sufficient to locate the true position of the face.

E. HistogramEqualization

Often images may be limited to colors that is, itmay be extremely grey, it lacks detail since the rangeof colors seems limited to mid grey levels or lackingin contrast enhancement. This enhancement is donewith histogram equalization, as shown in figure 5(a)and 5(b), to expand the colors within the image. Todo this, we need to calculate the cumulativefrequencies within the image. The cumulativefrequency for grey level g is defined as the sum of thehistogram data 0 to g [9]. If the cumulative frequencyis stored in an array, histogram equalization can bewritten as:

alpha = 255 / number of Pixels (3)

g(x,y) = cumulative Frequency[f(x,y)]*alpha (4)

g(x, y) is the grey level of pixel (x, y),

f(x, y) is the cumulative frequency.

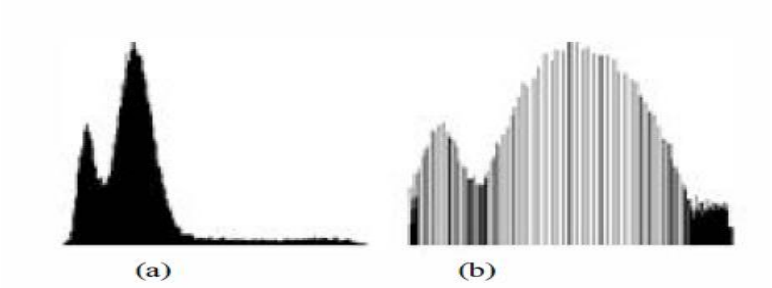


Figure 5. (a) An image histogram, (b) The result of (a) after histogram equalization.

PROPOSED FACE DETECTION.

The entire paper can be split up into two parts: a)Training b) Recognition.

A. Training

In the training phase the algorithm used is Adaboost. In this phase the image is split up into thesub image of size 19x 19. The sub image is comparedwith the variables in the database obtained from theYale [10]. The data base will have 2429 face variables and 4547 non face variables. Based on the later results the weights and based classifiers are updated. Then the sub image is processed to calculate the best threshold, as shown in figure 6. The best threshold is calculated based on the previously trained data, which in tum depends on the haar feature classification. The Haar feature classifier ,classifies the face with non face based on five predetermined classifier values. These classifiers areidentified as rectangle with four coordinates bycalculating the integral image of the sub image. Theintegral image is nothing but the cumulative sum ofall the image pixels. The process is repeated for theentire image with the sub image size as window.When the calculated threshold is found as weakclassifiers it is then passed through the adaboostalgorithm. The adaboost algorithm acts on the weakclassifiers using alpha parameter and update theweight based on that.

B. Recognition

Then the recognition algorithm is used to identifythe data using the weights obtained from the training phase. The phase starts with sorting the weights with descending order. Then the image is normalized toidentify the face and non face areas with the sorted weights. The image is splited with the sub image ofsize of 19x 19. The Haar cascade feature identification concept is used to identify the face and non face. The Haar cascade feature works on the basis of Haar feature calculation. This process repeated for the entire image to identify the face region. The histogram equlisation is used to reduce the variable illumination conditions using cumulative frequency, as illustrated in the figure 7.

IV IMPLEMENTATION AND EXPERIMENTAL RESULT

A. Implementation

The implementation uses the database whichconsists of 2429 face images and 4547 non faceimages. Training with yale database took 50 hoursapproximately and the algorithm accuracy is found as93%.In our case we use image of variable sizes and with minimum rectangle of size 19x 19 to obtain bestfeature extraction. The implementation consists of 5feature rectangle associated with the haar featur es.For every image we have calculated 51000 haarfeatures using above said rectangle. We used the14x 18 matrix classifier ranging from 0 to 6183 andused 6976 weights ranging from 0.000095 to 0.00023which is distributed with range of 200% to recognizethe face in the image.

B. Experimental Result

The elapsed time taken for recognition of lens image is 19.620610 seconds. The figure8 illustratesthe distribution of weights after training.

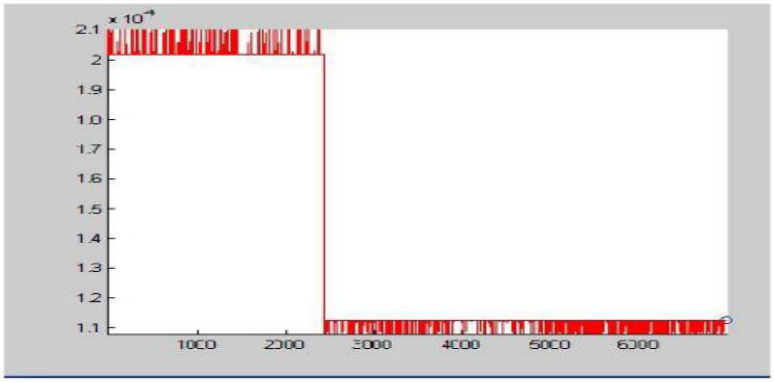


Figure 8 Distribution of weights after training.

The face detected output images are shown in figure9(a), (b).

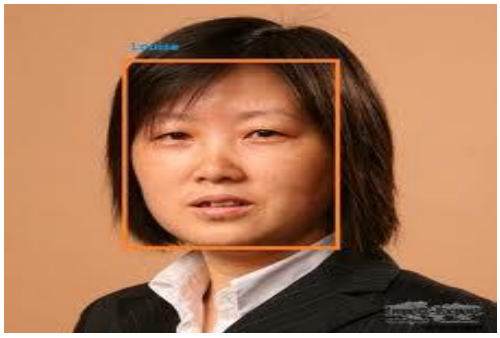
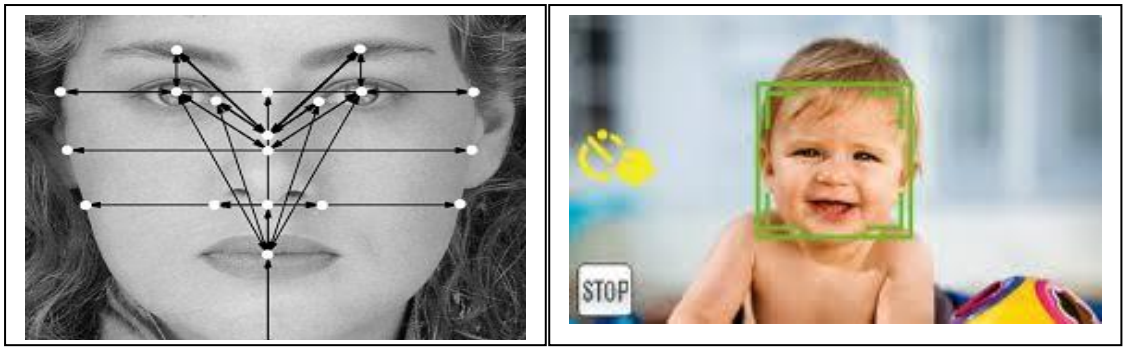


Figure: 9 (a) & (b) Face detected output.



Some facial points and distances between them are used in face recognition

V. CONCLUSION

In this paper the FPGA module can detect faces with reliability in real time. This paper has verified a process that overcomes low detection rates caused by variation in illumination using histogramequalization. The proposed face detection developed with adaboost algorithm can detect faces with high reliability.

VI. FUTURE EXTENSION

Various face recognition techniques are represented through various classifications such as, Image-based face recognition and Video-based recognition, Appearance based and Model-based,2D and 3D face recognition methods. This paper gives a review of different face recognition techniques available as of today. The focus is on subspace techniques, investigating the use of image pre-processing applied as a preliminary step in order to reduce error rates. The Principle Component Analysis, Linear Discriminant Analysis and their modified methods of face recognition are implemented under subspace techniques, computing False Acceptance Rates (FAR)and False Rejection Rates (FRR) on a standard test set of images that pose typical difficulties for recognition. By applying a range of image processing techniques it is demonstrated that the performance is highly dependent on the type of pre-processing steps used and that Equal Error Rates (EER) of the Eigenface and Fisherface methods can be reduced using the method.

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GPS-copilot: real-time location based adaptive cruise control system involving driver health and head distraction analysis

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Abstract: Adaptive Cruise Control (ACC) is an electronic system that allows the vehicle to slow while approaching another vehicle and accelerate again to the preset speed when traffic is cleared. It also warns the driver and/or applies brake support if there is a high risk of a collision. The project aim is to design a GPS equipped ACC system that (apart from performing normal ACC functions) slows down the vehicle intelligently when it enters speed restricted zones such as schools and colleges. It is also capable of detecting the speed breakers ahead and controls the vehicle dynamically according to the speed limit set for that part of the road. The system also continuously monitors driver distraction and driver health condition and brings the vehicle under ACC control if the need arises. There are a variety of ways in which drivers can get distracted while driving, for example looking sideways, talking over a mobile phone etc. Driver head movement indicates if he is distracted or not. Our system is capable of sensing this. Another major issue is drivers in city buses or cars who are aged above 40 are at a higher risk of heart attack or similar heart related problems. A heart attack for a city bus driver while driving is fatal not only to him but also for the passengers. Heart rate is a vital symptom for identifying this condition. Our system senses the heart rate of the driver. In real-world scenario this system should need to perform the operation within some timing deadline and must be extremely responsive or the result is fatal. Hence the system utilizes the services of a RTOS (Real-Time Operating System). GPS aided ACC with Driver Status Monitoring can be implemented in all types of vehicles where safety will be given first priority and has the potential to become a standard part of any future vehicle.

Keywords: *Autonomous vehicles, gps, acc, fuzzy logic, intersection management.*

Introduction

People died in road traffic accidents in the European Union. Some 1.9 million people were injured, some of them severely. The economic damages generated by traffic accidents were estimated at €€ 200 billion, corresponding to approximately 2% of the European Union's Gross National Product. In order to solve this problem, European Commission has taken the challenge of reducing by one half this cipher by the year 2010, mainly applying new information and communication technologies. One of the most dangerous maneuvers is the circulation through road intersections and the various modalities of priority and directions. The research on intelligent vehicles for intersection management is actually a technological challenge, with some groups working in this area worldwide. The philosophy is the integration of vehicle-infrastructure components and functions into cooperative intersection collision avoidance systems using wireless communication technology. Some developments have been carried out as driving aids for augmenting the safety in roadway intersections. In California PATH Program some Intersection-Decision-Support systems have been developed in order to advise the driver in one of the most critical situations: left turn across path with incoming vehicles [1], and some working scenarios to test these systems have been defined [2]. More USA research are described in [3]. In Europe, several projects of the 6th Frame Work Program (FWP) deal with these driving aids. That is the case of Inter safe Project, where an ADAS is under development to detect a potentially dangerous situation in road intersections and to warn the driver [4].

kind of situations. In the Intelligent Control Systems Laboratory of the Griffith University, in Australia, some autonomous vehicles, Cyber cars, have the capability of performing an automatic route and dealing with basic intersection scenarios [5].

Another full autonomous vehicle driving application is that of the INRIA IMARA group in France. In this case and also using Cyber car vehicles, first steps in automatic intersection management are being carried out, allowing the cooperation of two of these cars in giving the way in intersections, using laser sensors and communications [6].A first simple case of use has been implemented. In this paper we present the approach of the AUTOPIA Program of the Industrial Automation Institute of Spain for automatic driving in roadway intersection, based on GPS and wireless communications. We deal with the two simplest cases, in intersections in which the autonomous vehicle is circulating on a non-priority lane. These two cases of use are: the situation where a car is stopped in a priority lane and the autonomous vehicle circulates through the non-priority one and the situation where both cars are circulating in collision trajectory, with the autonomous going along the non-priority lane. Depending on its speed and position and the speed and position of the vehicle circulating over the priority lane, the autonomous driving system decides whether to stop or to continue the route. Some real experiments have been executed showing the performance of the system.

Automatic Driving Architecture

When designing an architecture that emulates human driving, we have to look at how humans organize the driving task and what operations they perform. According to psychologists, human driving can be divided into three activity levels, depending on the attention, resources and perception that are applied. These are the strategic, tactical and control levels [7]. The strategic level includes planning, for example, choice of the best route to reach a destination. The tactical level comprises the execution of complex maneuvers like stopping, overtaking, giving way, etc. Finally, the control level refers to basic actions to keep the car on the right trajectory: moving the steering wheel, pressing the throttle or brake. These levels are ranked in descending order of complexity. This implies that the higher the complexity the more reasoning is needed and the less reactive the system is. A control system based on human behavior that will support automated operation has to be built around an architecture paradigm. In our case we have chosen Michon [7] model, implemented as a hierarchical architecture, capable of supporting automatic driving and that can be upgraded to deal with other maneuvers that conform to human driving scheme. In our case the strategic planning stage has been taken over by manual user route selection. Then, our architecture is divided into six elements as shown in Fig. 1.

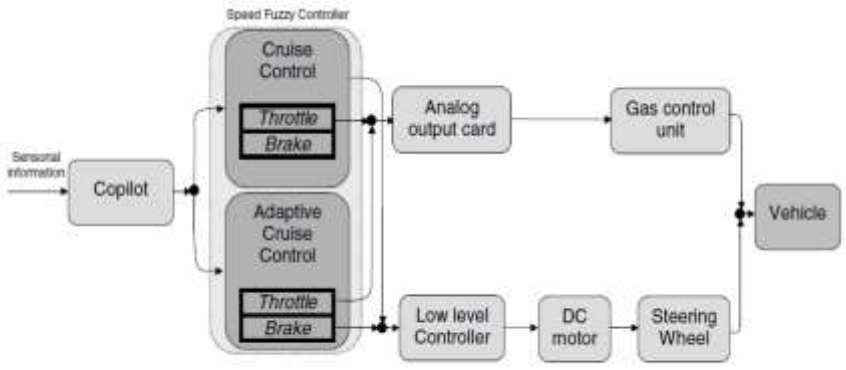

Fig. 1. Automatic speed control architecture

The first module is named copilot and emulates the tactical layer of human driving. It is a decision-making module whose mission resembles the job of a rally driving copilot. It tells the driver when the vehicle is entering a bend or a straight part of the route, when to increase or decrease target speed or when it is necessary to yield, controlling the sequence of operations to be carried out. Usually, the copilot manages the target speed with which the autonomous vehicle has to circulate though a segment of the road.

It has also to select whether this speed control is simple (cruise control) or it is necessary to adapt the speed in order to keep a safety distance from a precedent slower vehicle. In the case of intersection management, copilot aim is to manage the target speed of the vehicle, stopping or reducing its speed in the situations where it is necessary to give the way to another car that circulates in the other road of the intersection. Then it chooses between two kinds of speed behavior controllers: CC and ACC. These controllers represent the control layer of human driving and are modeled using fuzzy logic. This technique applies the knowledge of an expert operator, in this case a human driver, to control the equipment [8]. Another advantage is that complex mathematical models are not needed to manage the equipment. This is a very useful feature where hard nonlinear systems, like vehicle throttle and brake control, are concerned. In other words, by applying fuzzy logic to control the speed of a car, we are modeling driver behavior and not the vehicle itself. The throttle actuator consists of two additional modules: an analog output card that generates a proportional signal of the throttle fuzzy controllers output and the car gas control unit that selects the power effected by the motor according to this signal. The brake management is somehow different. The third architecture module is the low-level controller. Its mission is to receive the target turning angle from the active fuzzy controller and to generate the appropriate control signals for the motor to move the brake. A PID, tuned to manage the DC motor and attached to the brake pedal, forms this low-level controller. The fourth, fifth and sixth architecture modules are formed by the actual DC motor engaged by a pulley to the brake pedal.

First Case of Use

The first scenario that must be solved by our automatic intersection situation manager is shown. The gray car represents the autonomous vehicle and the white one represents a car stopped in the center of an intersection. This is, for example, the case of a car that wants to turn to the left in the intersection or traffic congestion. The automatic driving system controls the speed of the car, using digital cartography as reference. The GPS position also appears in the cartography of the intersection and the coordinates and the width of the cutting road. This information is used to reference the position of other vehicles from our route. Once known the ego-position and the cartography of the involved roads, we can define a "collision area" as the portion of road, on the intersection, where a car on the priority lane can represents an obstacle in the route. It is, in this case, the piece of road where both lanes are overlapped.

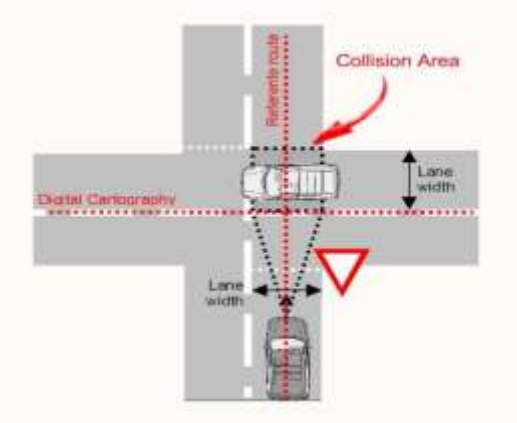

Fig. 2. Graphical representation of the first case of use of the automatic intersection management system

Second Case of Use

Once solved the simplest case of use, we extend it to solve a more complex situation too. In this case, the intersection management system for autonomous vehicles has to deal with this situation when other vehicle approaches the crossroad in colliding trajectory (figure 3), circulating through a priority road (horizontal).

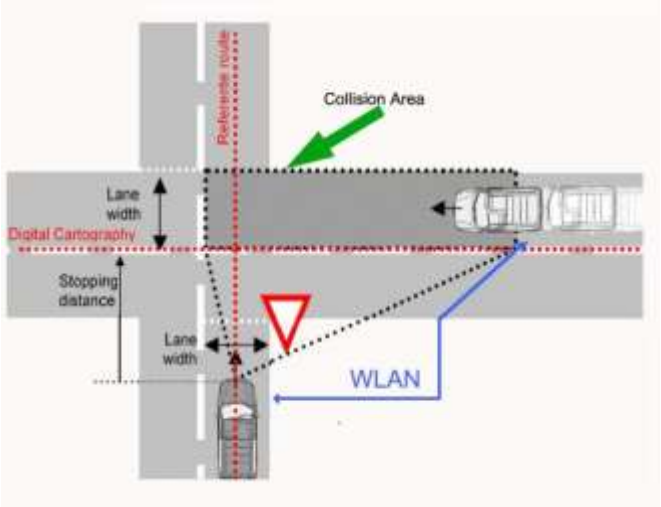

Fig. 3. Graphical representation of the second case of use of the automatic intersection management system

In this case, the gray vehicle is the equipped one that performs a guidance based on GPS. It also considers the cartography of the influence zone, detecting an intersection and a road that cuts its trajectory. Now, we redefine the collision area as the piece of the circulating lane of the priority road that start in the overlapping section up to a preset distance. The control system, also knows the position of the other vehicle transmitted through the WLAN. Then, the yield algorithm is: *IF* the speed of the priority vehicle is not 0 (vehicle not stopped,) *AND* it circulates in colliding route *AND* it is in the collision area, *THEN* stop at a safety distance. *ELSE*, continue route.

Hardware

Microcontroller: 32-bit ARM Cortex-M3 microcontroller, acts as the brain of the system

GPS:66-channel GPS module sends the location data as **NMEA packets**, interfaced to the microcontroller using UART serial communication. **Display:** monochrome Graphics LCD Display acting as the dashboard display for the driver to operate the system. **Heart Rate Sensor:** used to sense driver heart beats, output is digital pulses, finger mounted. **Head Tilt Sensor:** digital MEMS Compass sensor measures the head tilt angles

SONAR: ultrasonic distance sensor (dual) sense the front vehicle gap. **Throttle-Brake Sensor: a**nalog output brake pedal and throttle pedal sensing. **DC Motor:** wheel is attached with this motor. **Rotary Encoder:** used to sense the speed of the motor, attached with the motor shaft **Keypad:** used to input the control parameters of the ACC system by the driver ***Software***

Free RTOS: Market leading Open Source Real Time Kernel for Embedded Applications, makes the system responsive and deterministic. **Peripheral Drivers:** used for thread safe UART, I2C and PWM peripheral handling **Graphics Display Driver:** used to handle Graphics LCD in a thread safe manner to display text and plot graph. **NMEA Protocol Decoder:** used to parse the latitude and longitude position sent by the GPS.

Conclusions

Two case of use for automating the intersection maneuver with ongoing traffic has been studied, implemented and tested. With this equipment, it is feasible to add to autonomous vehicles the capability of automatic intersection management. The required data to achieve this maneuver is: real time GPS position of the vehicles on the road, speed of the vehicles of the road, a digital cartography of the driving route, GPS timestamps for message synchronization. In order to continue this work, our aim is to extend the behavior of the control system in yielding maneuvers. In these experiments, only stopping is a considered maneuver in order to respond a yielding. As future work we consider to reduce the circulation speed, optimizing the road occupancy and avoiding time loses in the trajectory following.

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Clustering Textures with EHG Algorithm for Modelling Video

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Abstract: In this paper we present a novel approach for common recognition of group activities for video surveillance applications. We propose a Energetic-based approach for detecting abnormal events in surveillance video. It requires the appropriate definition of similarity between events. Human pose estimation via motion tracking systems can be considered as a regression problem within a discriminative framework. We defined the overfitting problem was handled by Hidden Markov Model based similarity. We propose in this paper a multi model-based similarity measure. In this measure, the Hidden Markov Model training and distance measuring are based on multiple samples. The novel Energetic Hierarchical Group (EHG) method acquired the multiple training data. By iteratively reclassifying and retraining the data groups at different clustering levels, the initial training and clustering errors due to overfitting will be sequentially corrected in later steps. Experimental results on real surveillance video show an improvement of the proposed method over a stand column method that uses single sample- based similarity measure and spectral clustering.

Keywords: *pose estimation, group event detection, clustering, group representative, surveillance, motion tracking systems.*

1. INTRODUCTION

Identifying human behavior or human interactions has attracted increasing the research interests [1-6]. The following events are group events.

- people fighting
- people walking together
- people being followed
- group conversations in a party
- terrorist launching attacks in groups

In this paper we propose a multi model-based similarity measure to hold back the overfitting problem, where Hidden Markov Model representation is based on several similar samples. The acquisition of these several training data is by hierarchically collect and iteratively retraining the whole dataset, which is summarized as Energetic Hierarchical Group (EHG) algorithm. This algorithm can animatedly correct initial overfitting errors as the numbers of training samples increase (i.e. data clusters become bigger).

In addition, it is not sensitive to the absolute values of similarity, because simple comparison operation instead of eigenvalue decomposition is needed in the proposed approach.

In real videos, the suspicious events are rare, difficult to describe, hard to predict and can be subtle. However, based on the assumption that an abnormal event is associated with the distinctness of the activity. (e.g., a running person where everybody walks is interpreted as abnormal as well as a walking person where the rest run) and a normal event indicates the commonality. (e.g., a path that most people walk on)In this paper, we address the following issues for cluster incident discovery.

1.1 Cluster incident discovery with supple or unreliable number of group members

Most previous cluster event detection researches [1-2] use a Hidden Markov Model or its variation to model the human interactions. Some people try to recognize human interactions based on a content-independent semantic set [3-4]. However, most of these works are designed to recognize group activities with a fixed number of group members, where the input feature vector length is fixed.

They cannot handle cases where the number of group members is supple or even unreliable, which is often the case in our daily life (e.g., people may leave or join a group activity). In this case, the input feature vector length may vary with different number of group members.

1.2 Cluster incident discovery with a Hierarchical Activity Structure

In many scenarios, interacting people form subgroups. However, these subgroups are not independent to each other and they may further interact to form a hierarchical structure. For example, in Fig.1, three people fighting form a subgroup of fighting.

Fig 1 – Group activity

At the same time, another person is approaching the three fighting people and these four people form a larger group of approaching. This is an example of hierarchical activity structure with the cluster of approaching at a higher level than the group of fighting. Some algorithms [1-2] could be extended to deal with the problem of hierarchical structure event discovery when the number of group members is fixed.

However, to the best of our knowledge, our work is the first to address the problem of cluster incident discovery with a varying number of group members under a hierarchical activity structure.

1.3 Clustering with an Abnormal space Metric

Most previous clustering algorithms [6,10] perform clustering based on a symmetric distance metric (i.e. the distance between two people is symmetric regardless of the relationship of the people). In the group event detection, some activities such as "following" are asymmetric (e.g. person A following person B is not the same as person B following person A). Defining a suitable asymmetric distance metric and performing clustering under the asymmetric distance metric is an important issue.

2. GROUP-BASED APPROACH

2.1 HMM representation of video events

In many existing work on surveillance video analysis [2,3,6,7], video events are represented as object trajectories or time evolutions of certain frame features, which can be further modeled by HMM.

2.2 Detection of abnormal events

Based on the models of normal groups, detection of abnormal events can be performed to new video data. Specifically, given an unseen object trajectory *i*, the likelihood of observing *i* given any Hidden Markov Model of normal events.

2.3 Energetic Hierarchical Group (EHG)

Hidden Markov Modeling based on multiple samples provides a better representation of the trajectory data. However, this is a "chicken-and-egg" problem.

1). Space measurements: calculate distances between two groups *i* and *j* in the dataset.
2). Reclassifying : *mi* and *mj* are replaced by U ; then based on the *N*-1 HMMs, all the data are classified into *N*-1 groups by the maximum likelihood criterion;
3). Retraining : the *N*-1 HMMs are retrained based on the updated *N*-1 data groups;
4) Integration : the two groups *i* and *j* with smallest *dij* are integrated into one if the above criterion is satisfied.

3. Experimental Results

In this section, we show experimental results for our proposed methods and compare our results with other methods. We perform experiments based on the BEHAVE dataset [9]. Six long sequences are selected in our experiments with each sequence including 7000 to 11000 frames.

We try to detect seven group activities: Approach, WalkTogether, Split, Ignore, Chase, Fight, and RunTogether. The definitions of these seven activities are listed in Table I. We classify these seven activities into two categories with WalkTogether, Ignore, Fight, and RunTogether as normal activities, and Approach, Split and Chase as abnormal activities.

It should be noted that we extended the definition of activity Ignore. The two people will ignore each other if they do not have other activity correlation. Furthermore, Ignore will also be used to model the non interaction case between two normal groups. We also add a single activity into the normal activity list for those people that cannot be clustered into any normal group.

TABLE I - Normal Activities

Activity	Definition
WalkTogether	People walking together
Approach	Two people or groups with one approaching the other
RunTogether	The group is running together
Ignore	Ignoring of one another

TABLE III - Abnormal Activities

Activity	Definition
Fight	Two or more groups fighting
Split	Two or more people splitting from one another
Chase	One group chasing another

3.1 Cartridge selection

The video signal input can be receive through the following 3 ways:

1. From Local Hard drive
2. Live video url from internet.
3. Capture Devices (Web camera, TV tuner card etc..,)

3.2 Investigate cartridge

Avi media Library in .net Framework 2.0 is used. There are many inner classifications are available in avi format. Before extracting frames support for Tracking is fixed first.

3.3 Take out edges

Every video is converted as frames for object tracking. In live video internet urls there is no need to frame extraction. Because they are already available as Frames.

3.4 Track the items

Frames are like an image. Pixels are classified in an array. Horizontal and vertical Object matching is taken to track the variations in a pixels are identified. They are noted in a new array.

3.5 Rebuild the Frames with motion identifiers

Finally, based on a new array value Frames are constructed with Motion identifying red marks. From the frames new video is reconstructed.

3.6 Alarm & Sent Message

If the Abnormal event is detected, then the Alarm is set, at the same time the Alert Message is sent into nearest Police station.

4. CONCLUSION & FUTURE WORK

The Hidden Markov Model version of object line enables the measure of comparison between video events by cross likelihood but endure from the overfitting problem due to data shortage. We proposed in this paper a novel Energetic Hierarchical Group (EHG) approach, where the Hidden Markov Models are trained on many samples and the opening clustering errors caused by overfit are corrected in the iterative process and which is capable of improving the recognition accuracy. Experimental results demonstrate the effectiveness of our proposed algorithm. In the future work, we will explore the automatic switch mechanism to deal with the videos.

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Honey Bee Behavior Inspired Particle Swarm Optimization Technique for Adaptive Resource Allocation

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Abstract— Cloud computing is one of the rapidly improving technologies. It provides scalable resources needed for the applications hosted on it. As cloud-based services become more dynamic, resource provisioning becomes more challenging. The QoS constrained resource allocation problem is considered in this paper, in which customers are willing to host their applications on the provider's cloud with a given MA requirements for performance such as throughput and response time. Since, the data centers hosting the applications consume huge amounts of energy and cause huge operational costs, solutions that reduce energy consumption as well as operational costs are gaining importance. In this work, we propose an energy efficient mechanism that allocates the cloud resources to the applications using HBF-PSO framework.

Keywords- ***Resource Allocation, Ant colony framework,*** Cloud computing, Intelligent Agents component.

I. INTRODUCTION *(HEADING 1)*

Cloud computing provides much utility based on the pay –as-you go model. Cost and efficiency related issues were discussed by many researchers , which will no longer be a problem. This contribution also includes increase in efficiency, reduce energy consumption and operational cost. Load on servers in the data center changes dynamically. In order to tackle this dynamism with balanced load , the resources are allocated the services so that minimum number of servers will be used for hosting the services. Load balancing is a technique to spread work between two or more computers, network links, CPUs, hard drives, or other resources, in order to get optimal resource utilization, maximize throughput, and minimize response time. Load balancing can be useful when dealing with redundant communications links. For example, a company may have multiple Internet connections ensuring network access even if one of the connections should fail. A failover arrangement would mean that one link is designated for normal use, while the second link is used only if the first one fails. With load balancing, both links can be in use all the time. A device or program decides which of the available links to send packets along, being careful not to send packets along any link if it has failed. The ability to use multiple links simultaneously increases the available bandwidth. Major telecommunications companies have multiple routes through their networks or to external networks. They use more sophisticated load balancing to shift traffic from one path to another to avoid network congestion on any particular link, and sometimes to minimize the cost of transit across external networks or improve network reliability. The notion of complex collective behaviour emerging from the behaviour of many relatively simple units, and the interactions between them, is fundamental to the field of artificial life. The growing understanding of such systems offers the prospect of creating artificial systems which are controlled by such emergent collective behaviour; in particular, we believe that the exploitation of this concept might lead to completely new approaches for the management of distributed systems, such as load balancing in telecommunications networks.

In such networks, Calls between two points are typically routed through a number of intermediate switching stations, or nodes; in a large network, there are many possible routes for each such call. It is thus possible to relieve actual or potential local congestion by routing calls via parts of the network which have spare capacity. Load balancing is essentially the construction of call –routing schemes which successfully distribute the changing load over the system and

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minimise lost calls. Of course it is possible to determine the shortest routes from every node to every other node of the network. In this way the average utilisation of nodes will be minimised, but this is not necessarily the ideal way to avoid node congestion, as this has to do with how the traffic on the network is distributed. Controlling distributed systems like these by means of a single central controller has several disadvantages. The controller usually needs current knowledge about the entire system, necessitating communication links from every part of the system to the controller. These central control mechanisms scale badly, due to the rapid increase of processing and communication overheads with system size. Failure of the controller will often lead to failure of the complete system. There is the additional practical commercial requirement that centrally controlled systems may need to be owned by one single authority.

II. PARTICLE SWARM OPTIMISATION AND BEE ALGORITHM-LOAD BALANCING

To bring about such a load balanced solution , optimization should also brought about with minimum cost and power to attain faster resource allocation. Swarm-based optimisation algorithms (SOAs) mimic nature's methods to drive a search towards the optimal solution. SOAs include the Bee Colony Optimisation algorithm , the Genetic Algorithm (GA) [3] and the Particle Swarm Optimisation (PSO) algorithm [4]. Mathur et al [6] describe a hybrid of the ACO algorithm and the GA for continuous function optimisation. Individual solutions in a population are viewed as "particles" that evolve or change their positions with time. Each particle modifies its position in search space according to its own experience and also that of a neighboring particle by remembering the best position visited by itself and its neighbors, thus combining local and global search methods [4]. There are other SOAs with names suggestive of possibly bee-inspired operations [7-10]. However, as far as the authors are aware, those algorithms do not closely follow the behaviour of bees. In particular, they do not seem to implement the techniques that bees employ when foraging for food.

A colony of honey bees can extend itself over long distances (more than 10 km) and in multiple directions simultaneously to exploit a large number of food sources [7,8]. A colony prospers by deploying its foragers to good fields. In principle, flower patches with plentiful amounts of nectar or pollen that can be collected with less effort should be visited by more bees, whereas patches with less nectar or pollen should receive fewer bees [9,10]. The foraging process begins in a colony by scout bees being sent to search for promising flower patches. Scout bees move randomly from one patch to another. During the harvesting season, a colony continues its exploration, keeping a percentage of the population as scout bees [8]. When they return to the hive, those scout bees that found a patch which is rated above a certain quality threshold (measured as a combination of some constituents, such as sugar content) deposit their nectar or pollen and go to the "dance floor" to perform a dance known as the "waggle dance" [7]. This mysterious dance is essential for colony communication, and contains three pieces of information regarding a flower patch: the direction in which it will be found, its distance from the hive and its quality rating (or fitness) [7,10]. This information helps the colony to send its bees to flower patches precisely, without using guides or maps. Each individual's knowledge of the outside environment is gleaned solely from the waggle dance. This dance enables the colony to evaluate the relative merit of different patches according to both the quality of the food they provide and the amount of energy needed to harvest it [10]. After waggle dancing on the dance floor, the dancer (i.e. the scout bee) goes back to the flower patch with follower bees that were waiting inside the hive. More follower bees are sent to more promising patches. This allows the colony to gather food quickly and efficiently. While harvesting from a patch, the bees monitor its food level. This is necessary to decide upon the next waggle dance when they return to the hive [10]. If the patch is still good enough as a food source, then it will be advertised in the waggle dance and more bees will be recruited to that source.

In complex and large systems, there is a tremendous need for load balancing. For simplifying load balancing globally (e.g. in a cloud), one thing which can be done is, employing techniques would act at the components of the clouds in such a way that the load of the whole cloud is balanced. For this purpose, we are discussing honeybee foraging algorithm This algorithm is derived from the behavior of honey bees for finding and reaping food. There is a class of bees called the forager bees which forage for food sources, upon finding one, they come back to the beehive to advertise this using a dance called waggle dance. The display of this dance, gives the idea of the quality or quantity of food and also its distance from the beehive. Scout bees then follow the foragers to the location of food and then began to reap it. They then return to the beehive and do a waggle dance, which gives an idea of how much food is left and hence results in more exploitation or abandonment of the food source.

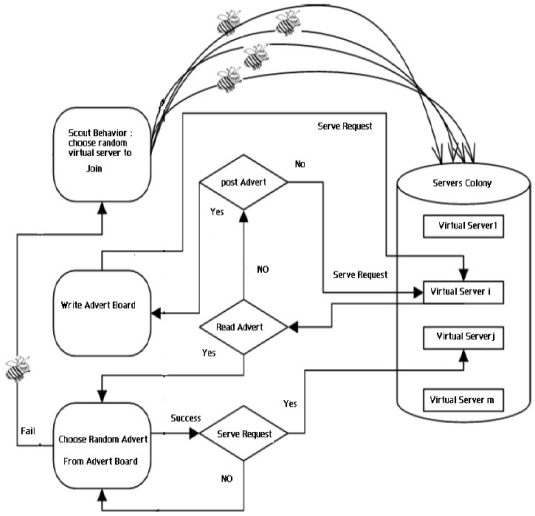

Fig :01 Server Allocations by Foraging in Honey bee technique (adopted from [5])

In case of load balancing, as the webservers demand increases or decreases, the services are assigned dynamically to regulate the changing demands of the user. The servers are grouped under virtual servers (VS), each VS having its own virtual service queues. Each server processing a request from its queue calculates a profit or reward, which is analogous to the quality that the bees show in their waggle dance. One measure of this reward can be the amount of time that the CPU spends on the processing of a request. The dance floor in case of honey bees is analogous to an advert board here. This board is also used to advertise the profit of the entire colony. Each of the servers takes the role of either a forager or a scout. The server after processing a request can post their profit on the advert boards with a probability of pr. A server can choose a queue of a VS by a probability of px showing forage/explore behavior, or it can check for advertisements (see dance) and serve it, thus showing scout behavior. A server serving a request, calculates its profit and compare it with the colony profit and then sets its px. If this profit was high, then the server stays at the current virtual server; posting an advertisement for it by probability pr. If it was low, then the server returns to the forage or scout behavior. It is diagrammatically given in fig. 01.

III. OUR SYSTEM ARCHITECTURE

The main aim of our resource allocation is to allocate the online service requests for applications which are CPU and memory intensive. The participants in the architecture include:

Users/Brokers: Users or brokers acting on their behalf submit service requests to the cloud via cloud controller for processing.

Cloud Controller: It acts as the interface between the cloud service provider and external users/brokers. It acts similar to the Queen in the bee colony.

Virtual Machines(VMs): This is where the applications of customers will be deployed. We can dynamically create, start, stop and migrate these VMs depending on our requirement, from one physical machine to another.

Physical Machines: These are the physical computing servers that will provide hardware infrastructure for creating virtual machines. The power consumption of each server in the data center along with the resource capabilities such as CPU processing power and primary memory before admitting them into cloud. We store this information consisting of Node Id, Processing Power, Memory and Power Consumption in a table.

We sort the nodes in the descending order of the following metrics.

$$PPW = \frac{processing\ power\ of\ the\ node(GHz)}{Power\ consumption\ of\ CPU(Watts)}$$

And

$$MPW = \frac{Memory\ capacity\ of\ node(GB)}{Power\ consumption\ of\ memory\ (Watts)}$$

Where, PPW = Processing Power per Watt, MPW = Memory Consumption per Watt

The power consumption is given as the power consumed by CPU or memory when their utilisation is 100% which is measured before admitting the node in the cloud. We assume that the power consumed by all the remaining components of a node are same for all the nodes. We consider that, all the nodes are having the same network connectivity and access to the shared persistent storage space that stores the VM disk images.
We store this information in a table called Available Resource Table with Available node's Id, current power consumption and remaining capacity updated by the gathered information from bee agents. This table is represented as an Array List with a pointer (Allocation ptr) being pointed to the node on which next service request is deployed. This pointer will be adjusted by different bee agents. The functionality of different bee agents are given below:

A. Cloud Controller & Queen Bee:

The requests from the customers consisting of the following, are given to the controller.

(i) Throughput THPUT) (In %)

(ii) Avg. Response Time(RTIME)

(iii) Application Code

(iv) Operating System

Cloud controller maintains a queue(Q) for storing the service requests for hosting the applications. It enqueues each of the service request received, in this queue. It generates the tester, scout, cleaner and worker bees periodically. The movement of these bee agents is modeled in the following way. Each bee except Queen & Worker maintains a Visited Node list which is initially empty. Each node in the cloud maintains a list of neighbouring node's information. Whenever an bee reaches a node, it updates the controller about the current utilisation and randomly chooses an unvisited neighbouring node. When all the nodes are covered, it makes the Visited Node list empty and continues again in the same way. We can change the number of bees that will be produced so that it will yield better results depending on our requirement. The next subsection describes the method used by worker bees for accepting or rejecting the service requests.

B. Worker Bee:

Whenever a service request received in the queue, one of the worker bees creates a VM with a specific CPU processing power and memory etc, if accepted. So, worker bees are always looking in the queue to check if there are some pending requests to be processed. If such a request is found, it dequeues the request. Since most of the CPUs are work conserving, we are creating a VM like Amazon Standard Instance [11] with specific CPU processing power and memory. Depending on the load, more intensive applications can use the resources of the other VMs having less load. The worker bee is only responsible for deploying the request on a VM. Load balancing decisions are taken by tester bee. After deploying, it creates a monitor agent that monitors the hosted application. The MA looks as in table 1.

Table 1: The schema for Monitor Agent

VM name	Operating system	Space required	Type of application

The monitor agent calculates the Avg. response time and throughput of the hosted application by continuously monitoring it. It passes this information to the hypervisor on that host in the form of a variable. When the tester bee queries the node for utilization information, hypervisor will send this value along with utilisation information .when the value is 0, there is no need for balancing, if the value is 1 , the tester bee will try to allocate this VM to a better node that have more available resources than current node among the currently running nodes and will not try to wake up a new node. If it's value is 2 then, it will wake up the next power efficient standby node if needed as it is required to handle the heavier loads. Depending on these values, the tester bee balances the load.

C. Tester Bee:

The main job of the tester bees is to get the utilization and power consumption information from each of the node and to update the available node's list as in table 3. It also takes the load balancing decisions. Load balancing on a node will be taken care by the hypervisor. We provide the algorithms for load balancing of various hosts in the cloud. We consider that the utilisation of 80% of CPU and 80% of memory of a node is considered to be desirable utilization and above 90% is considered to be peak. However, we can change them according to our requirement. We get the utilisation of CPU and memory information by probing the proc file system in Linux and resource utilisation in Windows. The tester bee will update this information in the Available nodes list along with the current power consumption shown by power top utility[12]. We have used the existing utilities for measuring power consumption because the existing power models, based on the utilisation, are not accurate at measuring it[13]. In order to improve the process of creating the VMs, we put three nodes below the current allocation node in standby mode and create the VMs with specific operating systems to be able to configure the application on them quickly. We prefer standby mode to hibernate mode because it requires less time to wake up a node from standby mode than from hibernation. We consider that the overhead of VM migration is negligible. The next subsection describes about the node discovery and registration which will be done by scout bees.

D. Scout Bee:

The aim of scout bee is to discover the newly added cloud nodes providing computing and memory services. When such a new node is found, it adds it to the available resource table(ART) as in table 4. It is done through node registration. Node Registration:

The node which wants to join the cloud must have to inform one of the nodes in the cloud by sending a request. Each request is being analysed by the scout bee and placed in the Data analysis table(DAT) as in table 2.When the scout bee visits a node and finds a request for joining, it registers the node with a unique id. It updates this information in the available node's list(ANL) with resource utilisation and power consumption and places this node in appropriate position in the list. Whenever a node is added by administrator in the event of resource scarcity, then the registration will be done by cloud controller node. We assume that the node that is completing the registration for newly joining node will not get failed during the registration process. If it fails before registration, new node will contact another node in cloud.

The various schema include:

Table 2: Schema for DAT:

Client_id	Node_id	Space requirement	OS	Memory required	Power consumption estimate

Table 3: Schema for ANL:

Node_id	Utilisation

Table 4: Schema for ART

Node_id	Remaining power	Remaining space

E. Cleaner Bee:

It maintains the available resource table by removing the unavailable resources from the list. When this agent reaches a node in cloud and if it didn't respond to that agent for a specific time duration, then it assumes that this node is failed and it takes necessary actions for recovery and will remove this node information from the available node's list. It removes the cloned VMs from the nodes if they are under utilised or if the performance is more than required. It also removes the VMs from the nodes whose service agreement get expired. It sends an alert to the customer before some days so that the service can be renewed if they needed. The algorithm to be proposed is given here:

IV FUTURE DIRECTIONS AND CONCLUSIONS

We have investigated several cloud computing test beds and found that cloudsim simulator[2] is suitable for testing the proposed mechanism. So, we are in the process of implementing the proposed mechanism on the cloudsim toolkit and the performance evaluation is in progress. We also plan to improve this by incorporating the load prediction and usage models so that this can be applied to real cloud environments.

We have proposed a power efficient, agent based solution for allocation of resources to cloud applications. We believe that this mechanism is very flexible and can be extended with improvements, as the solution modules are modelled as independent intelligent agents. We can incorporate additional functionalities in any of these HBF-PSO agents.

```
Begin
  Initialise parameters
   Analyse Available Node List(ANL)
        Number of servers(N_S) – Resource
       For all resources(N_S)
          Space and Memory utilisation of each servers
       Start_queue
         Receiving request from users (N_R)
          For all (N_R)
           Store data in Data Analysis Table (DAT)
          Start allocation of VM
            If VM available
                Allocate VM
            Else
                Check for standby / Power off VM
            Else
                Create new VM
           Update VM allocation data to Monitor Agent(MA)
          Update ANL,ART
         Update Computing and Memory requirements serviced
       End N_R
       Check for node balance
       If balanced then
          Wait for another updated request queue
            If memory and space requirement could be satisfied
                        Allocate
            Else
                        Notify_admin(Resource scarcity)
            Else
                Balance the server load
                        Migrate VM / Clone VM
                If VM cloned
                    Check lease time > Criteria
                        Check utilization < satisfactory limit
                          Remove VM
                        Else
                         Criteria > Lease time > Grace period
                              Notify_User (end of service)
                        Else
                          If service time over then
                           Remove VM
                        End VMcloned
     End_balance
    End_queue
```

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The Role of Data Mining-Based Cancer Prediction system (DMBCPS) in Cancer Awareness

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ABSTRACT: Cancer is one of the major problem today, diagnosing cancer in earlier stage is still challenging for doctors. Breast cancer is one of the major death causing diseases of the women today all over the world. Every year more than million women are diagnosed with breast cancer worldwide over half of them will die because of the late diagnosing of the disease. So many researches have undergone for detecting the cancer based on data mining technology each approach has its own limitations. This makes us to take up this problem and to implement the Data mining based cancer prediction System (DMBCPS). We have proposed this cancer prediction system based on data mining technology. This system estimates the risk of the breast cancer in the earlier stage. This system is validated by comparing its predicted results with patient's prior medical information and it was analyzed by using weka system. The main aim of this model is to provide the earlier warning to the users, and it is also cost efficient to the user**.**

INTRODUCTION: The body is made up of trillions of living cells. Normal body cells grow, divide into new cells, and die in an orderly way. Cancer begins when cells in a part of the body start to grow out of control. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells keep on growing and form new cancer cells. Breast cancer is a malignant tumor that starts in the cells of the breast. Breast cancer is characterised by the uncontrolled growth of abnormal cells in the milk producing glands of the breast. There is no sure way to prevent from the breast cancer. But there are things all women can do that might reduce their breast cancer risk. Breast cancer not only found in women, men also have less chance of getting this cancer. Various tests are available for predicting breast cancer, but detecting cancer in earlier stage is difficult, but earlier detection of cancer is curable. In the following sections, previous researches are discussed. We have proposed the cancer prediction system based on data mining. Cancer prediction system estimates the risk of the breast cancer at the earlier stage. This system was validated by comparing its predicted results with patient's prior medical information and analyzed through weka tool.

*Prior Studies of Cancer Prediction***:**

K. Rama Lakshmi et al [2013] this research paper analyzes how data mining techniques are used for predicting different types of major life threatening diseases. It reviewed the research papers which mainly concentrated on predicting heart disease, Diabetes, Breast cancer, HIV/AIDS and Tuberculosis. Ankit Agarwal et al [2011] collected a data from SEER dataset and develop the accurate survival prediction model for lung cancer using data mining techniques. They were used several classification techniques for preprocessing the data and they used tree classifiers for best prediction. They have developed the online lung cancer outcome calculator for estimating risk of morality after 6 months 9 months, 1 year, 2 years, and 5 years of diagnosis. Seyyid Ahmed Medjahed et al [2013] worked on K-NN method. It is one of the popular methods used to diagonise breast cancer. The quality of the results depends largely on the distance and the value of the parameter "k" which represent the number of the nearest neighbors.

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In this paper, they study and evaluate the performance of different distances that can be used in the K-NN algorithm. Also, they analyze this distance by using different values of the parameter "k" and by using several rules of classification. This work will be performed on the WBCD database (Wisconsin Breast Cancer Database) obtained by the university of Wisconsin Hospital. Shwetha kharya [2013] collected a data from SEER dataset and various data mining techniques were used to predict the breast cancer. Among the various data mining techniques she found that decision tree is the best classifier with greater accuracy.

Architecture of Data Mining - Based Cancer Prediction System

Detecting cancer is still challenging for the doctors in the field of medicine. Even now the actual reason and complete cure of cancer is not invented. Various tests are available for predicting cancer, but detecting cancer in earlier stage is difficult, but earlier detection of cancer is curable. With the help of data mining we try to predict the risk of cancer in earlier stage. We develop a system called the cancer prediction tool which predicts three specific cancer risks. Specifically, Cancer prediction tool estimates the risk of the breast, skin, and lung cancers by examining a number of user-provided genetic and non-genetic factors. The main aim of this model to provide the earlier warning to the users, to make a precaution based on their risk status.

The Architecture of Data mining – Based Cancer Prediction System

In this work, architecture is designed and implemented using decision tree algorithm (Data mining technique). Decision tree is one of the easier data structure to understand data mining. Rules from the training dataset are first extracted to form the decision tree which is then used for classification of the testing dataset. A decision tree is necessarily a tree with an arbitrary degree that classifies instances. When the user login into the cancer prediction system the Home screen will provide the information about cancer. It will give the details about the cancer which can be predicted by the cancer prediction system. It also shows characteristic features which are considered to be the increasing risk factor for causing cancer.

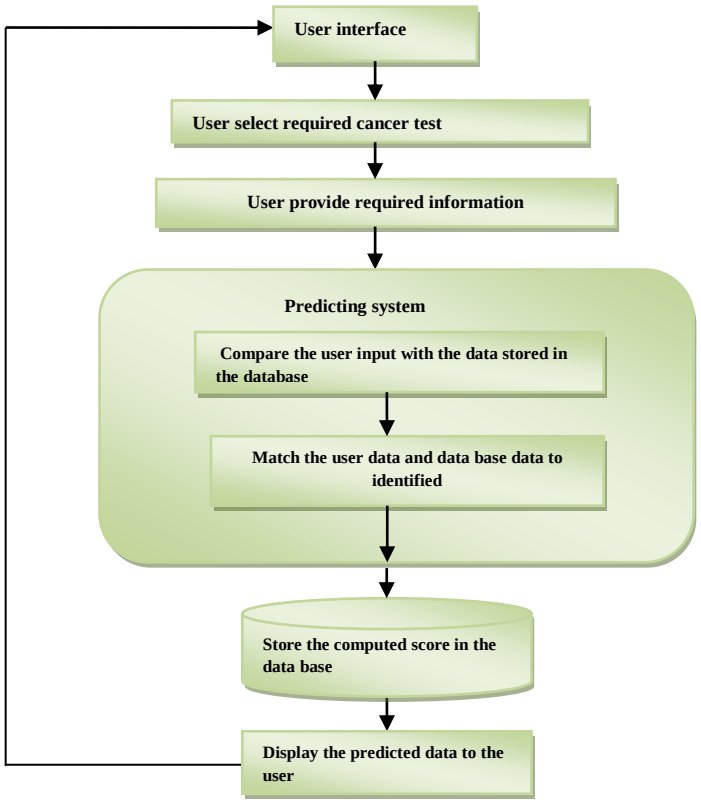

Figure.1 Architecture of Data mining Based Cancer Prediction System

It provides some basic symptoms of cancer which will help the user to consult the doctor for medical advice. The doctor will analyze the symptom and the treatment will be given in the early stage if it is predicted as cancer. When user enters into the cancer prediction test page, there will be a list of questions in the screen the user need to answer all the questions that is given in the list. Each question has some value. The value was given by the researchers after consultation with the doctors and previous research. Based on the answer provided by the user, the cancer prediction system will assign the value for each answer. The final value will be compared with the predefined risk value to assign cancer risk. Generally prediction system have four levels of risk like low level, medium level, high level, very high level. Once the risk is assigned the data given by the user is stored in the data base. The result will be shown to the user through the database.

Algorithm

Step 1: Enter the text

Step 2: Predicting system will checks for the condition.

Step 3: System predicts the values based on the user answers.

Step 5: The range of the risk is determined based on the predicted value.

Step 6: If the value is ≤18 the risk is considered as a low risk.

If the value is 18< risk value ≤ 21 the risk is considered as a intermediate risk

If the risk value is 21< risk value ≤23 is considered as a high risk.

If the risk value is > 28 is considered as a very high risk.

Step 6: The user data is stored in data base.

Step 7: The result is shown to the user through data base.

The implementation of Data mining based Cancer Prediction System

This work constructed an expert system called the cancer prediction system which predicts breast cancer risk. It helps the user to predict cancer risk level. It can save costs and time. It helps the user to predict their risk and take the necessary steps based on their risk status. This system was implemented using vb.net and sql.

This prediction system consists of various functional units listed below:

- Administrator
  - Report
- New user
- User Page
  - Prediction test
    - ✓ Breast cancer
- Feedback

PERFORMANCE EVALUATION OF CANCER PREDICTION SYSTEM

The data mining based cancer prediction system has been developed and implemented for predicting cancer. A study has been conducted to measure the effectiveness of Data Mining Based Cancer Prediction System among users.

The purpose of the study is twofold.

- Effectiveness of Data Mining Based Cancer Prediction System through feedback.
- Cancer prediction system through WEKA tool.

Cancer prediction system – population and sample

To find the effectiveness of data mining based cancer prediction system, this system has implemented on web. Around 496 responses have been collected during September to October 2013.Details of the responses given in the table 4.1

Gender	No of respondents
Male	**379**
Female	**117**
Total	**496**

Table.1. No of respondent based on Gender

Objectives

- To find out the performance of the Data Mining Based Cancer Prediction System among the users based on cancer prediction.
- To find the user opinion about the newly developed Data Mining Based Cancer Prediction System based on gender.

Data Analysis

Instrumentation

The feedback form was designed to find out the performance of the Data Mining Based Cancer Prediction System.

Questionnaire design

It was decided to prepare a questionnaire following the guideline given by Liket (1932). Considering variables under study, a scale was constructed and standardized by using psychometric techniques such as item analysis, reliability etc., and it was administered on the sample of the study. The researcher was very careful to phrase questions clearly and unambiguously, so that respondent is in no doubt which answer to give.

Procedure of data collection

The feedback form was provided in their prediction system software itself. The user filled the form after the completion of risk prediction.

Performance Analysis

The effectiveness of cancer prediction system is analyzed in two ways, one is getting feedback from the user after the completion of risk prediction using Data Mining Based Cancer Prediction System and another one is analysis of cancer prediction system through weka tool. We have used classification techniques (data mining technique) to know the efficiency of Data Mining Based Cancer Prediction System through weka tool. Classification is a technique that predicts categorical class labels. It classifies data (constructs a model) based on the training set and the values (class labels) in a classifying attribute and uses it in classifying new data. Classification is a two – step process consisting of Model Construction and Model Usage. Model Construction is defined as a process of describing a set of predetermined classes whereas Model Usage is helpful for classifying future or unknown objects. We have used patient's prior medical data, healthy person data set as a training data set and data obtained from the cancer prediction system used as a test data. We have used two classification techniques decision tree and navie bayes to know the efficiency of Data Mining Based Cancer Prediction System. The experiments run on a smaller dataset.

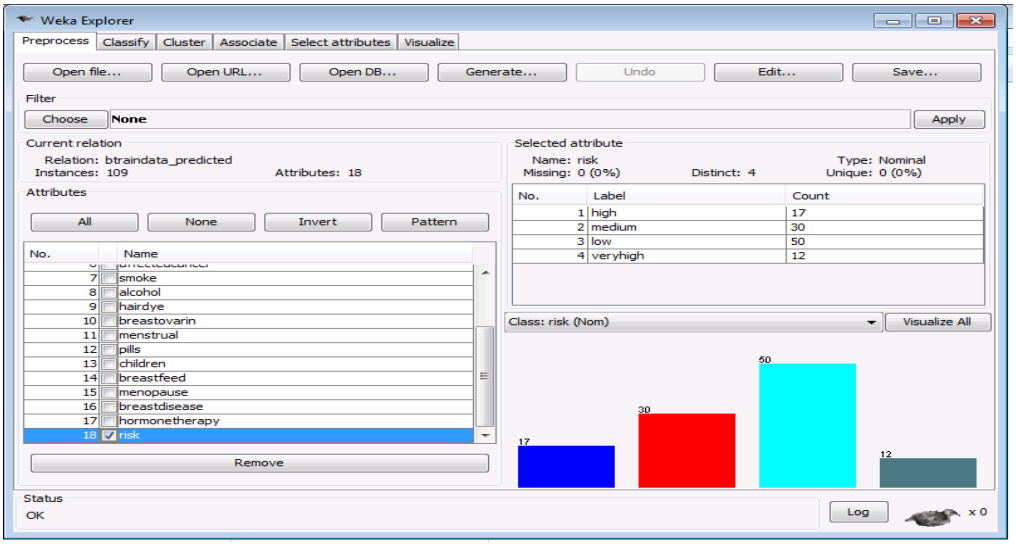

Fig.2. J48 risk prediction for breast cancer using WEKA

Experiments using WEKA for Breast Cancer

A. Decision Tree J48

The decision tree approach is more powerful for classification problems. There are two steps in this techniques building a tree & applying the tree to the dataset. The decision tree used in WEKA is termed as J 4.8 which is a modification of the C4.5 algorithm. J48 algorithm uses pruning method to build a tree. Pruning is a technique that reduces size of tree by removing over fitting data. The J48 algorithm recursively classifies data until it has been categorized as perfectly as possible. This technique gives maximum accuracy on training data. The overall concept is to build a tree that provides balance of flexibility & accuracy. In this we have used J48 algorithm to know the efficiency of prediction system. The front screen of the WEKA software is shown in the following figure. All the attributes in this database are displayed in row format in the left half of the screen and on the right side of the screen the bar graphs represent the distributions of the different attributes that are considered for data mining.

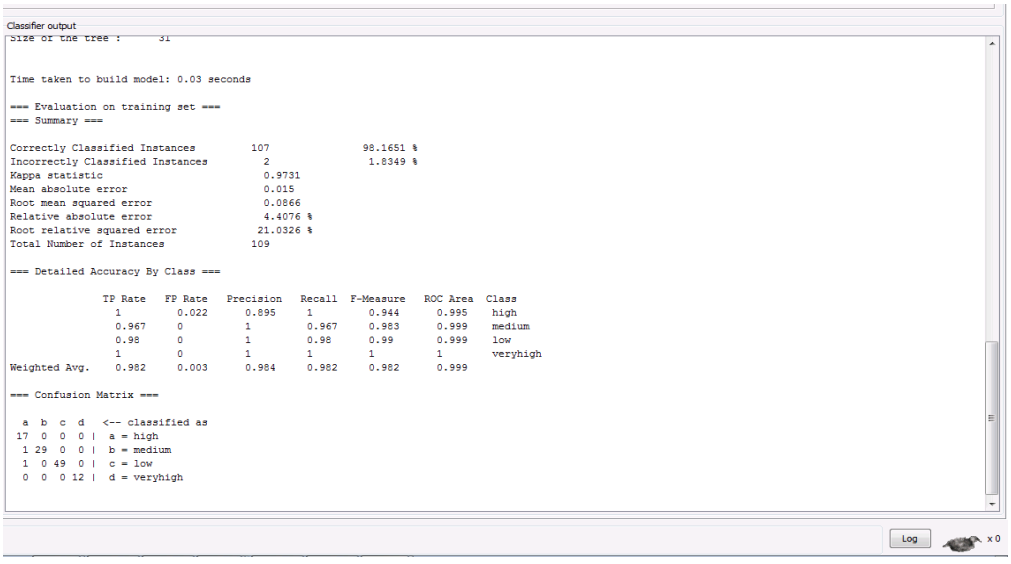

Fig.3. Result of Breast cancer prediction using J48 in WEKA

In the graph ash color bar represents the very high cancer risk, blue color represents high risk, red color represents the intermediate cancer risk, cyan represent the low risk. The decision tree to be created, rules are required to be extracted from the training data. Once the rules are extracted, the decision tree is created based on the rules and the association between the attributes. The decision tree with respect to breast cancer research is shown in the following figure. Classification on the test data is done based on the decision tree that is created. The confusion matrix is displayed in the classifier output screen as shown in the below fig4.4. A confusion matrix is a matrix showing the predicted and actual classifications. Suppose we have m attributes then the confusion matrix is of size m x m.

B. ID3

ID3 builds a decision tree from a fixed set of samples. The resulting tree is used to classify future dataset. The leaf nodes of the decision tree contain the class name whereas a non-leaf node is a decision node. In the graph (fig 4.5) ash color bar represents the very high cancer risk, blue color represents high risk, red color represents the intermediate cancer risk, cyan represent the low risk.

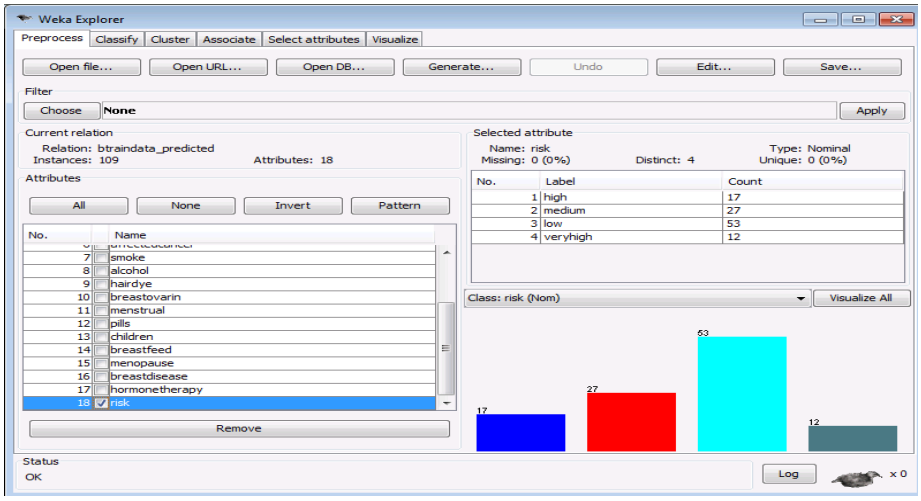

Figure 4. ID3 Risk Prediction for breast cancer using WEKA

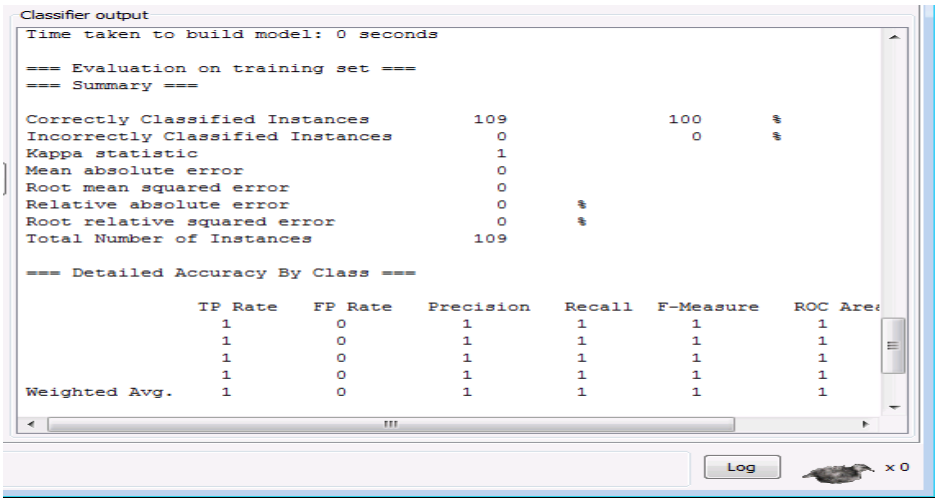

Fig 5. Result of Breast cancer prediction using ID3 in WEKA

B. Navie Bayes

Naïve Bayes is a statistical classifier which assumes no dependency between attributes. It attempts to maximize the posterior probability in determining the class. All the attributes in this database are displayed in row format in the left half of the screen and on the right side of the screen the bar graphs represent the distributions of the different attributes that are considered for data mining**.**

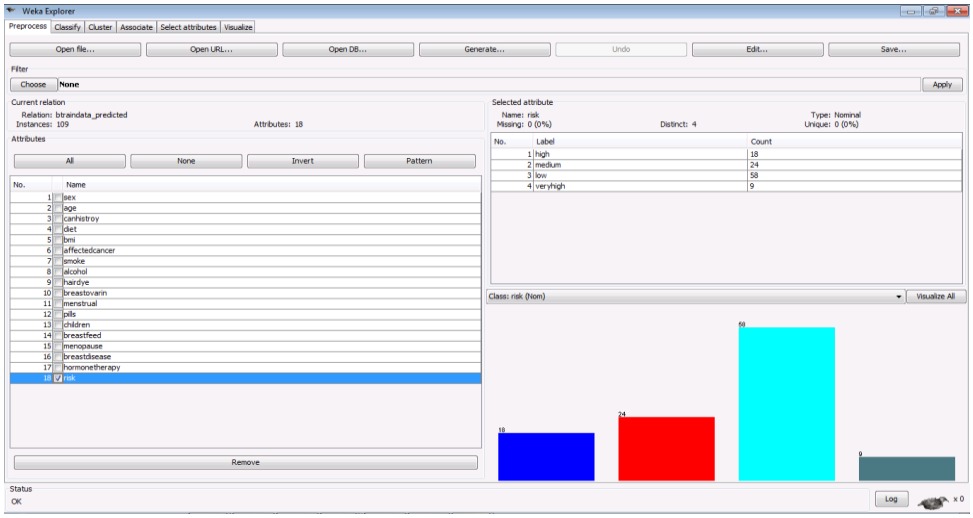

Fig 6. navie bayes risk prediction for breast cancer using WEKA

In the graph ash color bar represents the very high cancer risk, blue color represents high risk, red color represents the intermediate cancer risk, cyan represent the low risk.

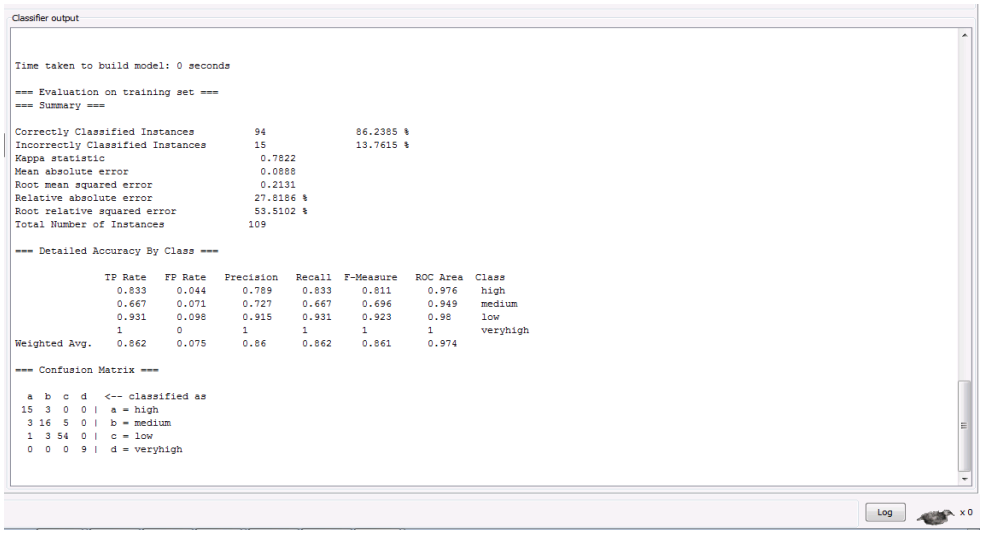

Fig 7. Result of Breast cancer prediction using Navie bayes in WEKA

The performance of the newly developed system is analyzed based on the feedback obtained from the users. We have used decision tree, navie bayes algorithms to find the effectiveness of DMBCPS through weka tool. The proposed method is efficiently calculating the risks of breast cancer. It helps the user to predict their risk and take the necessary steps based on their risk status. The results of this tests shows that ID3 algorithm provides better performance on DMBCPS.

CONCLUSION

In this work we have developed a system called data mining based cancer prediction system, which predicts three specific cancer risks. Specifically, Cancer prediction tool estimates the risk of the breast cancer by examining a number of user-provided genetic and non-genetic factors. An architecture of this data mining technique based prediction system, combining the prediction system with mining technology. In this model we have used one of the classification algorithms called decision tree. This tool is validated by comparing its predicted results with the patient's prior medical record, and also this is analyzed using weka tool. Once the user enters into the cancer prediction system, they need to answer the queries, related to genetic and non genetic factors. Then the prediction system assigns the risk value to each question based on the user responses. Once the risk value is predicted, the range of the risk can be determined by the prediction system. We have four levels of risk low level, intermediate, high level and very high level. Based on the predicted risk values, the range of risk will be assigned. The result can be shown to the user through data base. The above mentioned technique can be successfully applied to the data sets breast cancer as it was successfully verified on the breast cancer. Finally this prediction system is validated is through a weka tool, it provides the better accuracy compare to the existing system. The main aim of this model to provide the earlier warning to the users, and it is also cost and time benefit to the user.

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Even and Odd Parity Generator and Checker using the Reversible logic gates

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Abstract— Digital data transmission is the mostly used in the communication. The data transmission from source to destination should be without loss of information. This is made possible by using the method of parity generator and parity checker. The parity checker and the parity generator are of two types they are even parity generator and parity checker, odd parity generator and checker. Reversible logic gates compremises various parameters in the data transmission. There are various reversible logic gates to meet the needs of the parity generator and parity checker. Reversible gates probably reduce the number of gates utilised in the conventional method. The Parity generator and the parity ckecker is effective method to find the error in the destination end. The reversible logic gate called Feynman gate is used in the process which make the data transmissionmuch more effective with no data loss and is simulated using the simulator 'Modelsim'.

Index Terms: Parity generator, parity checker, Reverversible logic, Feynman gate

I. INTRODUCTION

THE parity generator is the method to chek the error present while transmitting data from the transmitter node to the receiver node. Parity generator is of two types they are odd parity generator and the even parity generator. The reversible logic gates are used in the generation of the parity generator and for the parity checker. This is done using the reversible logic gates since the reversible logic gates are non- information loss gates. This parity generating technique is the most efficient technique and is one of the most widely used in the error detection techniques for the data transmission. This generation and the checking of the parity of the bits are performed by the method of the reversible logic gate makes the data transmission much easier than the conventional methods. This use of the reversible logic gates reduces the loss of information, delay and the number of gates used. Reversible logic enables the circuit to perform the retival of the information easily by using the garbage values in the reversible gates.

II. REVERSIBLE LOGIC

The reversible logic has one to one mapping between the input and the output vectors. The reversible gates do not loose any information and the input and the output are uniquely retrievable from each other. The reconstruction of the input data is made possible from the output and the garbage vectors at output state. The reversible logic gate effectively reduces the heat dissipation and hence the loss of information is reduced and thereby allows higher densities and higher speed. These gates reduce the complexity of implementation and works in a single clock pulse. The reversible logic Gates have zero fan-out and hence the power dissipation is also zero [1]. The reversible logic has garbage values along with the output terms. The relation between the input, output and the garbage value is as below [2]

Input + Constant Input = Output + Garbage

Quantum cost, garbage, constant input, delay are the main parameters to be discussed on the reversible logic. Delay calculation is an essential feature of every circuit to manipulate the efficiency. It is denoted by Δ. Quantum cost of a circuit is mainly based on the number of quantum gates present in the circuit.

The calculation of the Quantum cost is done by using the gate whose quantum cost is known and finally adding up all the quantum cost of the gates present in the circuit [3]. Each and every gate produces the output which is not used for the further synthesis and those left out outputs are called the 'garbage'. Although the garbage values are not used for the further synthesis they are essential to achieve the reversibility. The constant inputs are the 0's and 1's. The constant input terms are also called as ancilla input bit [4].

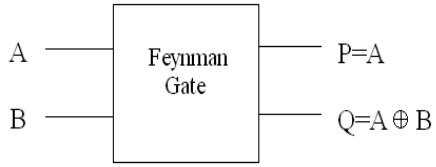

Fig. 1. Reversible Feynman Gate

The reversible logic gate used in this paper is the Feynman gate and this gate has the quantum cost of about 1.

III. PARITY GENERATOR

Parity bits are extra signals which are added to a data word to enable error checking. There are two types of Parity - even and odd. An even parity generator will produce a logic 1 at its output if the data word contains an odd number of ones. If the data word contains an even number of ones then the output of the parity generator will be low.

A	B	C	OUTPUT (P)
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Table. 1. Even parity generator truth table

The truth table for the odd parity generator bit is given by the table below:

A	B	C	OUTPUT (P)
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

Table. 2. Odd parity generator truth table

By concatenating the Parity bit to the data word, a word will be formed which always has an even number of ones i.e. has even parity. Parity is used on communication links (e.g. Modem lines) and is often included in memory systems. If a data or a word is sent out with even parity, but has odd parity when it is received then the data has been corrupted and must be resent. As its name implies the operation of an Odd Parity generator is similar but it provides odd parity. Even parity bit is given by the expression P = A xor B xor C. The even parity bits generation is given as shown in the above tables.

And the expression for the generation of the odd parity generator is given by P = A xor B xor C.

The even parity checker is shown in the truth table shown below:

A	B	C	Pin	OUTPUT (P)
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Table.3 Even parity checker truth table

And the expression for the generation of the odd parity generator is given by P = A xor B xor C xor Pin.

The odd parity checker is shown in the truth table shown below:

A	B	C	Pin	OUTPUT (P)
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

Table. 4. Odd parity checker truth table

And the expression for the generation of the odd parity generator is given by P = A xor B xor C xor Pin.

IV. SIMULATION AND DISCUSSION

The output of the even and odd parity generator and the parity checker is obtained by using the 'Modelsim' Simulator is as given below:

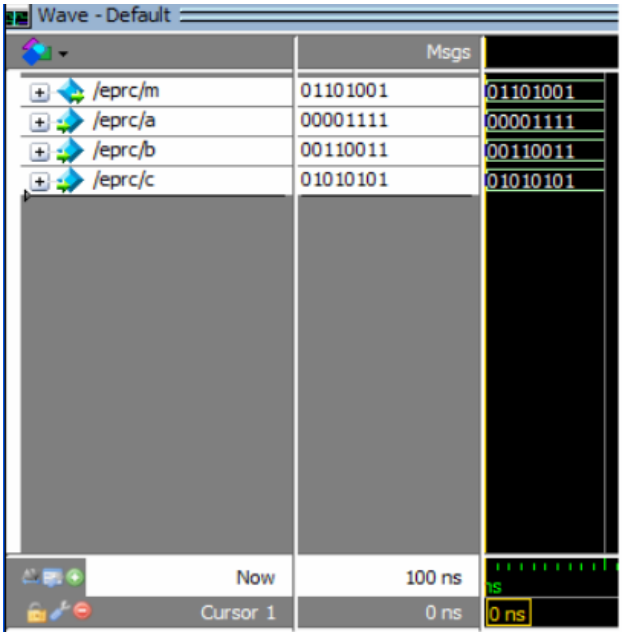

Fig. 2. Even parity generator simulation

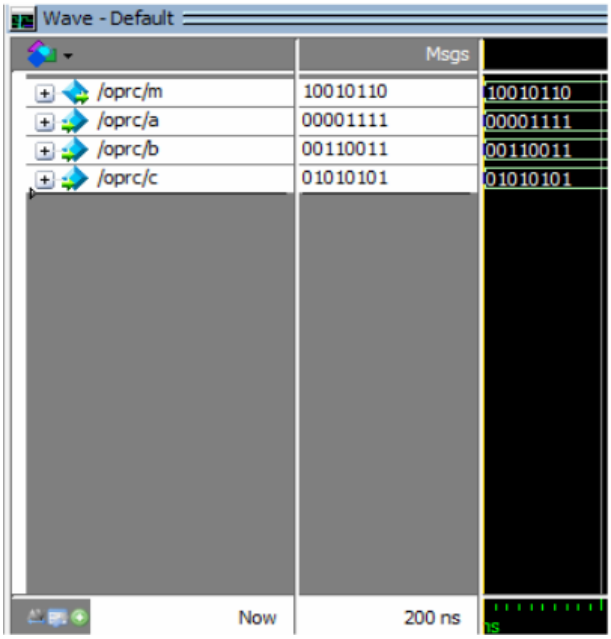

Fig. 3. Odd parity generator simulation

Parity generator	Number of Feynman gates	Garbage value
Even	16	16
Odd	24	16

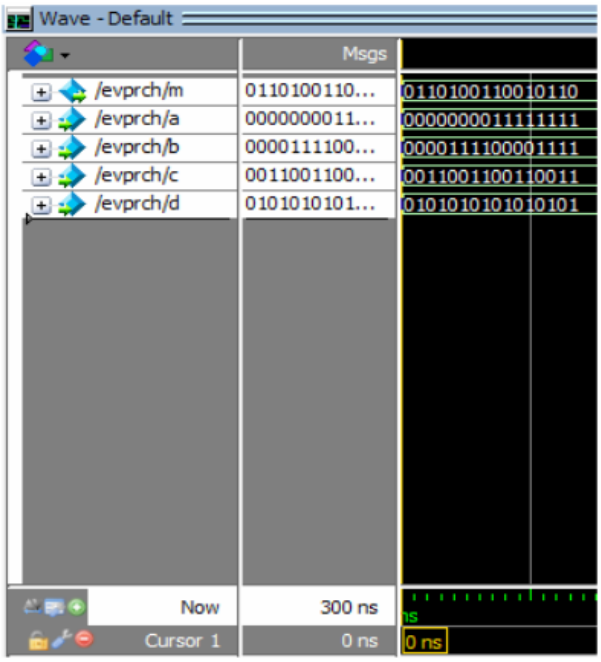

Fig. 4. Even parity checker simulation

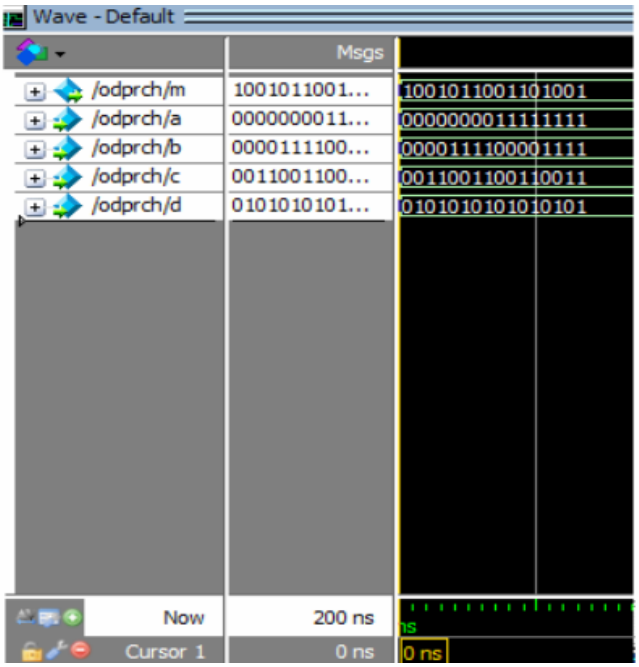

Fig. 5. Odd parity checker simulation

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Parity checker	Number of Feynman gates	Garbage value
Even	48	48
Odd	64	48

V. CONCLUSION

Thus the retiving of the data from the input data is made easy and more efficient while performing wit the reversible logic gates. The use of Feynman gate for parity generator and the parity checker with reduced power dissipation. The retival of the input data from the output so generated is made highly possible by the use of the garbage values.Hence reversible logic gates are effective than the conventional methods for efficient data transmission. The loss of information is zero in case of using the reversible logic gates for the data transmission in the digital form.

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Study of Mobile Payment Business Model Based on Third-Party Mobile Payment Service Provider

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Abstract—With the fast developing mobile commerce, mobile payment is springing up as a new industry. It is obvious that replacing traditional cash or bank card with mobile will cause a payment revolution. However, some factors such as individual demand, rapid change of external market environment, complicated industry chain, and numerous business models are barrels of a successful mobile payment. This paper integrates the theory of business mobile, value net and industry chain to present a framework of mobile payment value net and propose three mobile payment business models suiting for current market environment. Among these models, we focus mainly on the mobile payment business model based on third-party mobile payment service provider, and a relative case is introduced to a detailed exploration.

Keywords-mobile commerce, mobile payment, business model, value net, third-party mobile payment

I. INTRODUCTION

Since the 21st century, with the rapid development of Internet and e-commerce, mobile e-commerce, as an emerging industry, has made a great progress. Mobile payment (MP), as a subset of mobile e-commerce, has in flourish too. Although has a bright prospect, there are still many problems existed in this industry. Building an effective and feasible business model is a core of these problems. Business model was called to a business theory by Peter.

Drucker[4], the master of management, and operational innovation and deep change by Hammer[6]. Some researchers argued that business model refers to ways of doing business[10], a interact activities of suppliers, partners and customers, and a value creator [1][3][11][12].

Other scholars believed that business model is a mixture of value stream, revenue stream and logistics[2], and a integration of business process, customers, suppliers, sales channels, resources and capabilities[13], has the character of intuitive, integrated and creative spirit[5], will enhance the competitive advantage of enterprise[14]. Mobile payment business model has been explored form the perspectives of industrial chain and value chain [7] [8], and by the analyses method of case and SWOT [8][9]. These studies are applicable on the early stage of mobile payment industry. However, with a more complex market environment, analytic tool of value chain shows its limitations. So we introduce the theory of value net to study mobile payment business model.

This paper summarizes the theory of business model, cards clearly the complicated relationship of stakeholders in the mobile payment industrial chain, introduces the theory of value net, and then conceives a framework of mobile payment value net, on the basis of which, mobile payment business models suiting for current market are derived. It will help to provide some useful suggestions for the development of the mobile payment industry.The paper is structured as follows: section 2 exposes the theory of industrial chain and value net to derive the framework of MP value net. Section 3 finds out a MP business model most suit for current market by carding relationship of members in the value net. Section 4 analyzes this business mobile. Finally, section 5 concludes this paper.

II. MOBILE PAYMENT VALUE NET

Based on the observation of literatures, we can find that MP industry chain is commonly understood directly from the upstream supplies to the downstream customers in the chain.However, some professional, from the perspective that MP crosses both financial and telecommunication industries, suggest that stakeholders of MP should be divided into rule makers and payment participants according to whether they participate into the real-time mobile payment directly. This paper supports the latter view because it can help to develop a deep understanding of the relationship of members in the industry chain.

 Supervisor

Mobile payment supervisors include the domestic government and international regulatory institutions. As rule makers and supervisors, they enact related laws, regulations and industry standards, management market orders, coordinate the relationship among stakeholders in the industry chain, propagandize MP to the public to create a harmonious operation atmosphere.

 Technology provider

Technology providers include terminal equipment manufacturers and mobile payment technology provider. They make profits from providing technology and equipments to solve the problems of mobile payment or bundling with selling terminal by cooperating with mobile operators.

 Financial institution

Financial institutions include banks, CUP (China Union Pay), and credit card organizations. As account managers, they ought to ensure the process of mobile payment safe and smooth. With abundance experience of operating electronic cash, they are able to build a safety and flexible mobile payment system.

 Mobile operator

The main responsibilities of Mobile operators are to set up a mobile payment service platform, supply a secure telecommunication channel, and develop a variety of services meeting demand of consumers. It is a key element in the industry chain and an important bridge among financial institutions, users and service providers.

 Third-party payment service provider

As a link between financial institutions and mobile operators, independent third-party payment service providers play a significant role in the development of mobile payment.They are able to integrate all resources existing in industry chain, coordinate the relationship of stakeholders, and develop services meeting different demand. In the mobile payment system, they have to implement two interfaces, one of which is linked with bank to manager MP business, and the other is linked to mobile communication net to identify the terminal.

 Merchant

Mobile payment system will allowed merchant getting a faster payment process by reducing the intermediate links,lowing service, operation, management costs, achieving better customer satisfaction.

 User

As end-users of mobile payment, they are concerned about business security, convenient operations, and abundance services. The number of users is an important indicator used to measure the success of mobile payment. To meet the demand of users, payment services should be designed to a fast, convenient, individual payment. To mobile operators, financial institutions and third-party payment service providers, development of mobile payment will enhance customer satisfaction, expand the scope of business, lower costs, and improve business competitiveness. There are complicated relationships among them, who are collaborators as well as competitors. As a result, financial institutions will worry about mobile operators and third-party competing with their traditional payment market. Mobile operators will hope to push the third-party out from the industry by carrying out mandatory incompatible technologies.

All of these will hinder the competition of mobile payment industry, and dragging down the development of mobile payment process. With the complex relationship among stakeholders and extensive mobile payment services, the traditional perspective from value chain can not keep up with the requirement of industry development. So, we introduced value net to get a better understand of the mobile payment.As an integration of value chain, value net can overcome the shortcomings of linear and discrete analysis methods of value chain. Stakeholders in the value net not

only care for their own profit but also focus more attention on the relationship with others to create new ways of value creation by improving information interaction. Therefore, this paper suggests that mobile payment industry should be studied from the perspective of value net.

According to the theory of value net and David Porter's structure of value net, we develop a framework of mobile payment value net integrating with customers, electronic market platform, regulations and other node enterprises. (As shown in figure1)

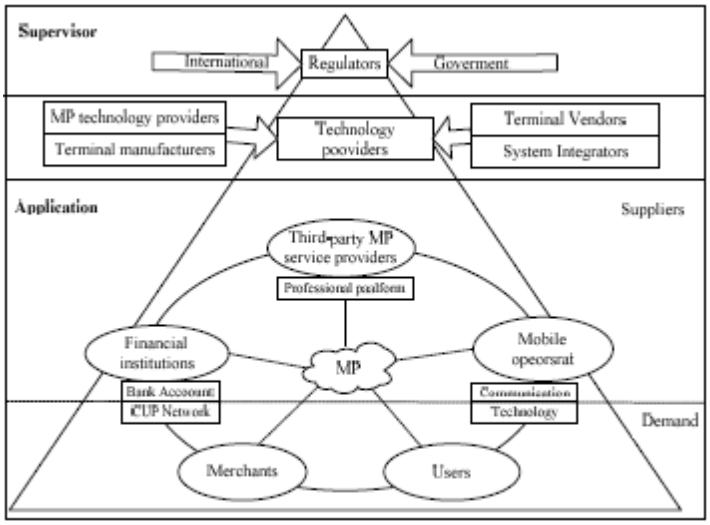

Figure 1. Framework of mobile payment value net

III. MOBILE PAYMENT BUSINESS MODEL BASED ON VALUE NET

Mobile payment business model involves all stakeholders of the industrial chain, such as mobile operators, financial institutions, third-party mobile payment service providers, merchants, users, hardware and software providers, regulatory agencies and so on.From an overall mobile payment industry perspective, this paper study mobile payment business model based on the value net. It will help to take a more clearly description on the MP industry, and provide a new way to create value. To begin with, customer is the core and value sources of value net. It is customer demand type and their value realization methods decide the leader of value net and its core competencies type. So, enterprises should choose a most suitable operational model to create customer value by matching their core competencies with demand. In addition, after extracting the core competence of industrial nodes, we will find the core enterprise in the net is not unique.

All of Mobile operators, financial institutions, third-party service providers and their combination have capacities leading the net. According to their core competence and customer resources, they can become a leader of different business areas in this industry. At the end of the day, from the perspective of the value net, not only the mobile payment industry should formulate strategies for the entire industry, but also node enterprises should develop diverse competitive strategies according to their different roles in the net. Only in this way, can enterprises ensure their value maximum. Figure 2 is a specific business model for mobile payment industry.

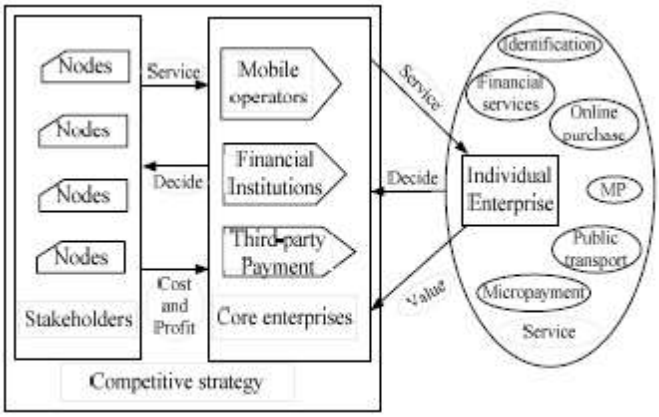

Figure 2. Framework of mobile payment business model

From figure 2, we can find out three kinds of MP business model: based respectively on mobile operators, banks and independent third-party mobile payment service providers. However, subjecting to laws and regulations, both financial institution such as bank of communications and mobile operators such as China Unicom can support few types of mobile business. Considering this, this paper focuses mainly on MP business model based on third-party payment service providers.

IV. MOBILE PAYMENT BUSINESS MODEL BASED ON THIRD PARTY SERVICE PROVIDER

A. Relative mobile payment process

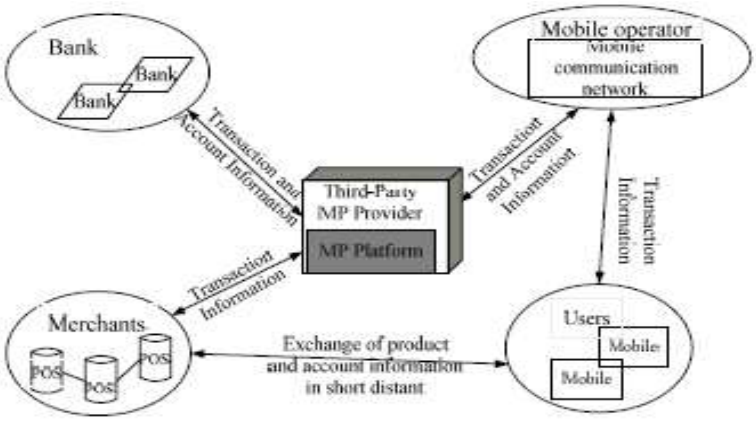

Figure 3. Mobile payment process based on third-party provider as shown in figure3, this process is based on independence third-party service providers, and mobile operators only play a role of information channel or an agent of settlement. Bank act as a account manager, is a center of final settlement. The third-party provides a mobile payment platform for this payment process.

B. Benefits distribution of the model

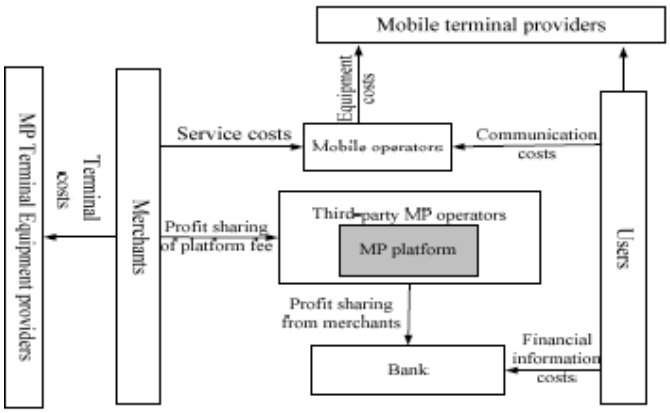

Figure 4. Benefit distribution of the model

As shown in figure4, the third-party providers charge merchants for platform fee and share it with bank. Mobile operators charge merchants and users for services and communication costs. Banks charge for costs of financial information from users. Users need not pay the transaction fees to merchants, but only pay for related information to mobile operators.

C. The characters of the model

Be coordinated properly, this model will enjoy larger information exchange and wider scope of resources sharing than other models. As the third-party service providers cooperate with CPU, users are allowed to operate on POS of any bank instead of only the bank their card belong to. Financial institutions and merchants can also share customer resources from different mobile operators. The third-party providers themselves are able to integrate information from and coordinate relationship of stakeholders, with flexible and
fast response to market. Its advantages are listed as follow:

- Efficient
- Resource reuse
- Sharing customer resources

D. Case Analysis

UMPay Co., Ltd. was jointly sponsored and founded by China Mobile Communications Corporation and China Union Pay in August, 2003. As a professional m-commerce service provider, UMPay serves customers nationwide, covering the fields of "FMS (Financial Messaging System)" and "Fund Collection", provide professional mobile e-commerce platform and various mobile information solutions for corporate customers, delivers safe, convenient and easy ecommerce services to individual users.

Strength: 1. Large scare of MP market 2. High customer satisfaction 3. Professional services	***Weakness:*** 1. Few industry experience 2. Narrow scope of services 3. Slow development
Opportunity: 1. Supported by government 2. Great demand 3. Fast development of e-commerence	***Threat:*** 1. Fierce competition 2. Little brand consciousness of payment platform 3. Limit consciousness of mobile payment

Presently, business of the company includes mobile bankcard payment, phone bill account, mobile Top-Up, Epayment, FMS, fund collection, loyalty exchange. It cooperate with Bus Company of Ningde in Fujian province to provide a 2.4G RFIDSIM standard phone card allowing the mobile playing the role of bus card. Users can use their phone as the bus card. And it also possesses an online mall, integrating its strategic patterns, allowing users operating the mobile payment conveniently. By the end of Oct 2010, UMPay had 150 million
individual and 500 corporate customers. Table 1 depicts SWOT of UMPay.

V. CONCLUSIONS

Large number of mobile users is a solid foundation for the development of mobile payment industry. With the relationship of stakeholders in this industry becoming more complex, the traditional perspective from value chain can not suit for exploring the present mobile payment. Therefore, this paper introduces the theory of value net into mobile payment industry, and develops a framework of mobile payment business model. As the model based on third-party MP service providers can support larger number of payment services than others, we mainly take attention to it and analyze its process and characters. Of course, there is limited understanding of value net and business model which are too complex to comprehend clearly. More importantly, the environment of mobile payment is changing rapidly, so it will take a loge time to analyze this
industry overall.

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